U.S. FISH AND WILDLIFE SERVICE SPECIES ASSESSMENT AND LISTING PRIORITY ASSIGNMENT FORM

Scientific Name:

Martes pennanti

Common Name:

fisher

Lead region:

Region 8 (California/Nevada Region)

Information current as of:

04/16/2012

Status/Action

___ Funding provided for a proposed rule. Assessment not updated.

___ Species Assessment - determined species did not meet the definition of the endangered or threatened under the Act and, therefore, was not elevated to the Candidate status.

___ New Candidate

_X_ Continuing Candidate

___ Candidate Removal

> ___ Taxon is more abundant or widespread than previously believed or not subject to the degree of threats sufficient to warrant issuance of a proposed listing or continuance of candidate status
>
> ___ Taxon not subject to the degree of threats sufficient to warrant issuance of a proposed listing or continuance of candidate status due, in part or totally, to conservation efforts that remove or reduce the threats to the species
>
> ___ Range is no longer a U.S. territory
>
> ___ Insufficient information exists on biological vulnerability and threats to support listing
>
> ___ Taxon mistakenly included in past notice of review
>
> ___ Taxon does not meet the definition of "species"
>
> ___ Taxon believed to be extinct
>
> ___ Conservation efforts have removed or reduced threats

___ More abundant than believed, diminished threats, or threats eliminated.

Petition Information

___ Non-Petitioned

_X_ Petitioned - Date petition received: 12/05/2000

90-Day Positive:07/10/2003

12 Month Positive:04/08/2004

Did the Petition request a reclassification? **No**

For Petitioned Candidate species:

Is the listing warranted(if yes, see summary threats below) **Yes**

To Date, has publication of the proposal to list been precluded by other higher priority listing? **Yes**

Explanation of why precluded:

Higher priority listing actions, including court-approved settlements, court-ordered and statutory deadlines for petition findings and listing determinations, emergency listing determinations, and responses to litigation, continue to preclude the proposed and final listing rules for the species. We continue to monitor populations and will change its status or implement an emergency listing if necessary. The Progress on Revising the Lists section of the current CNOR (http://endangered.fws.gov/) provides information on listing actions taken during the last 12 months.

Historical States/Territories/Countries of Occurrence:

- **States/US Territories**: California, Oregon, Washington
- **US Counties**:County information not available
- **Countries**:Country information not available

Current States/Counties/Territories/Countries of Occurrence:

- **States/US Territories**: California, Oregon
- **US Counties**: Colusa, CA, Del Norte, CA, Fresno, CA, Glenn, CA, Humboldt, CA, Kern, CA, Lake, CA, Madera, CA, Mariposa, CA, Mendocino, CA, Shasta, CA, Siskiyou, CA, Tehama, CA, Trinity, CA, Tulare, CA, Curry, OR, Douglas, OR, Jackson, OR, Josephine, OR, Klamath, OR
- **Countries**:Country information not available

Land Ownership:

The lands within the range of the West Coast DPS of the fisher consist of varying amounts of both privately and publicly owned forest land, with the majority of the non-urban privately owned lands managed for forest products. Other lands include tribal lands.

Lead Region Contact:

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Biological Information

Species Description:

The fisher, as described by Powell (1981, p. 1), is light brown to dark blackish-brown, with the face, neck, and shoulders sometimes being slightly gray. The chest and underside often has irregular white patches. The fisher has a long body with short legs and a long bushy tail. At 3.5 to 5.5 kilograms (kg) (7.7 to 12.1 pounds (lbs), male fishers weigh about twice as much as females (1.5 to 2.5 kg [3.3 to 5.5 lbs]). Males range in length from 90 to 120 centimeters (cm) (35 to 47 inches [in.]), and females range from 75 to 95 cm (29 to 37 in.) in length. Fishers show regional variation in typical body weight. For example, fishers from western North America weigh more in northern parts of their range than fisher in the southern extent of their range (Lofroth 2010, p. 10). Fishers are estimated to live up to 10 years (Powell 1993, p. 71).

Taxonomy:

The fisher (*Martes pennanti* Erxleben 1777, p. 470) occurs only in North America (Proulx et al. 2004, pp. 55–60, 64) and is classified in the order Carnivora, family Mustelidae, subfamily Mustelinae, genus Martes, subgenus Pekania (Anderson 1994, p. 21), but has been suggested to be placed in its own genus Pekania (Koepfli et al. 2008, p. 5). Goldman (1935, p. 177) recognized three subspecies of fisher, although he stated they were difficult to distinguish:

(1) *Martes pennanti pennanti* in the east and central regions;
(2) *M. p. columbiana* in the central and northwestern regions; and
(3) *M. p. pacifica* in the western region.

A subsequent analysis questioned whether there was a sufficient basis to support recognition of different subspecies (Hagmeier 1959, entire). Subspecies taxonomy as described by Goldman (1935, p. 177) is often used in reports, common usage, and the literature to describe or reference fisher populations in different regions of its range. Although genetic variation indicating patterns of population subdivision similar to the earlier described subspecies has been reported (Kyle et al. 2001, p. 2345; Drew et al. 2003, p. 59), the taxonomic validity of Goldman's designations of subspecies was rejected using entire mitogenome approaches (Knaus et al. 2011, p. 5).

Habitat/Life History:

Life History

Fishers are solitary except during breeding, territorial defense (Powell 1993, p. 166), and while females are raising kits. Fisher home ranges typically do not overlap extensively with adults of the same sex; however, male home ranges may overlap with multiple female home ranges (Powell 1993, p. 172; Powell and Zielinski 1994, p. 59). West of the Rocky Mountains in the U.S. and Canada, male home ranges tended to be three times larger than females averaging 18.8 square kilometers (km^2) [7.3 square miles (mi^2)] for females and 53.4 km^2 (20.6 mi^2) for males (Lofroth et al. 2010, pp. 67–68).

Female fishers do not typically give birth until at least 2 years of age due to delayed implantation (Powell and

Zielinski 1994, p. 46). Average annual reproductive rate (number of denning females divided by the number of adult females monitored during a single reproductive season) in the west was 0.64 (range = 0.39–0.89) (Lofroth et al. 2010, p. 57). Individual fishers, however, may not give birth every year and reproductive rates may change as females age (Weir and Corbould 2008, p. 28). Throughout their range, fishers use tree or snag cavities (Paragi et al. 1996, entire; Truex et al. 1998, p. ii; Weir 2003, p. 12; Aubry and Raley 2006, p. 16; Higley and Matthews 2006, p. 10; Self and Callas 2006, p. 6; Weir and Corbould 2008, pp. 105–106; Davis 2009, p. 23) to give birth to altricial young (Coulter 1966, p. 81). Kits may be moved to numerous den locations (Arthur and Krohn 1991, p. 382; Paragi et al. 1996, p. 80; Higley and Matthews 2006, p. 7) before they are weaned at approximately 10 weeks old (Powell 1993, p. 67). Once weaned, the kits often stay with the female, utilizing multiple structures (for example, tree cavities, hollow logs, log piles) (Truex et al. 1998, p. 35; Aubry and Raley 2006, p. 7, 16–17; Higley and Matthews 2006, p. 6–7) within the female's home range until juvenile dispersal in the fall or winter (Aubry and Raley 2006, p. 12; Matthews et al. 2009, p. 9).

Fishers in the DPS have a diverse diet with the dominant component in Oregon and California being small and mid-sized mammals (Zielinski et al. 1999, entire; Aubry and Raley 2006, pp. 25–27; Golightly et al. 2006, entire). In much of the fishers range across North America, both snowshoe hare and porcupine are important prey items (Powell 1981, p. 3). Within the current range of fishers in the DPS, the contemporary ranges of both these prey species do not overlap extensively with fishers (Bittner and Rongstad 1982, pp. 146–163; Dodge 1982, p. 355; Ellsworth and Reynolds 2006, p. 10). Studies of fisher diets in California support this conclusion. Diet studies in California have indicated fishers prey predominantly on mammals but their diet may also include birds, insects, and reptiles (Zielinski et al. 1999, entire; Golightly et al. 2006, entire).

A more extensive review of fisher biology and life history can be found in Lofroth et al. (2010, pp. 55–78).

Habitat

The West Coast population of the fisher inhabits forested areas from sea level along the California and Oregon Coast to approximately 1,970 to 8,530 feet (ft) [600 to 2,600 meter (m)] in the Sierra Nevada. Historically, a low to mid-elevation distribution was found throughout the Cascade Range in Oregon and Washington (Bailey 1936, pp. 298–299; Aubry and Houston 1992, pp. 69–70, 74–75; Lewis and Stinson 1998, pp. 4–5). Fishers in the DPS occur in a wide variety of forest plant communities (Buck et al. 1994, pp. 368–370; Self and Kerns 2001, p. 3; Zielinski et al. 2004b, pp. 650–651; Aubry and Raley 2006, pp. 3–4). In California, fishers occur in a wider array of plant communities (mixed conifer-hardwood forests) than historical populations to the north in Oregon and Washington. Some of the most productive habitats for fishers are within floristically diverse landscapes that likely provide for a wide variety of prey species (Buskirk and Powell 1994, pp. 285–287). Historically and currently, fishers do not occupy high elevation sub-alpine and alpine environments (Roy 1991, p. 42; Aubry and Lewis 2003, p. 82), and they avoid non-forested habitats such as open forest, grassland (Powell and Zielinski 1994, p. 55), and wetland habitats (Weir and Corbould 2010, p. 408).

The key aspects and structural components of fisher habitat are best expressed in areas that are comprised of forests with diverse successional stages containing a high proportion of mid- and late-successional characteristics (Buskirk and Powell 1994, pp. 286–287; Zielinski et al. 2004b, pp. 652–653, 655). Fishers will use a variety of successional stages when active reflecting those of their primary prey (Powell 1993, p. 92; Buskirk and Powell 1994, p. 287), but appear to be more often associated with stands containing complex forest structure (Buskirk and Powell 1994, pp. 286–287; Powell and Zielinski 1994, p. 53) that will typically reflect those of their primary prey (Powell 1993, p. 92; Buskirk and Powell 1994, p.287). Fisher home ranges are associated with moderate to dense forest cover (Zielinski et al. 2004b, pp. 653, 655, Thompson et al. 2011, p. 1168). Fisher rest and den sites are also strongly associated with dense canopy cover (Truex et al. 1998, p. 89; Yaeger 2005, pp. 48–49; Buskirk et al, 2010, p. 10; Purcell et al. 2009, pp. 2700–2701) and multiple canopy layers (Seglund 1995, pp. 27, 45–46). Large tree structure with cavities, deformed limbs, and other platform structures provide locations to rest (Seglund 1995, pp. 40–44; Weir et al. 2004, entire; Zielinski et al. 2004a pp. 481–482; Yaeger 2005, p. 44; Purcell et al. 2009, p 2703). Large trees or snags with cavities are a critical resource for denning female fishers (Truex et al. 1998, p ii; Simpson Resource Company 2003, p. 8; Yaeger 2005, pp. 46, 64; Aubry and Raley 2006, p. 16, Higley and Matthews 2006, p 10; Self and Callas 2006, p. 6; Weir and Corbould 2008, pp. 105–106; Davis 2009, p. 23). In most cases, these cavities are a result of heartwood decay (Weir 1995, p. 137; Aubry and Raley 2006, p. 16; Weir and Corbould 2008, p. 105; Reno et al. 2008, p. 19; Davis 2009, pp. 26–27). Snags and coarse down wood provide locations for fisher to rest (Purcell et al. 2009, p. 2703) and are important habitat components for many fisher prey species (McComb 2003, entire).

Forest structure that provides high quality fisher habitat should supply a high diversity, density, and vulnerability of prey to fisher predation. In addition, for successful reproduction and protection from predation, the forest structure must provide both natal and maternal den and rest sites (Powell and Zielinski 1994, p. 53). Younger forests may be suitable for fishers, in which complex forest structural components such as large logs, snags, and tree cavities are maintained in significant numbers (Lewis and Stinson 1998, p. 34). According to Buskirk and Powell (1994, p. 286), the physical structure of the forest and prey associated with those forest structure types are thought to be the critical features that explain fisher habitat use, rather than specific forest types. Powell (1993, pp. 73, 89, 96–97) stated that forest type is probably not as important to fishers as the vegetative and structural aspects that lead to abundant and diverse prey populations and reduced fisher vulnerability to predation.

Studies in British Columbia (Weir and Corbould 2010, p. 406) and California (Klug 1997, p. 5; Self and Kerns 2001, pp. 7–8, 10; Lindstrand 2006, pp. 50–51) have shown that fishers occur in heavily-managed forested landscapes that may have little mature or late-successional habitat. These studies report “a mosaic of seral stages” (Weir and Corbould 2010, p. 406), with “significant older residual components in harvested stands” (Klug 1997, pp. 5–7) or uncommon patches of dense-canopy and dead wood habitat elements that most likely provide the structural complexity required by fishers (Lindstrand 2006, pp. 50–51). Fishers also reproduce in managed forest landscapes and forest stands not classified as mature or late-successional, that provide some of the key habitat and structural components important to fisher (Self and Callas 2006, entire; Reno et al. 2008, pp. 9–16). Thus, a forested landscape that includes structural elements suitable for denning, resting, and prey habitat, with moderate to dense overhead canopy for fishers may be adequate habitat for occupancy. Currently, there are no data available reporting the fitness of fisher populations located in intensively managed landscapes or landscapes comprised mostly of older, less intensively managed forests.

There are also various abiotic variables associated with fisher presence (Carroll 2005, pp. 5–8; Carroll et al. 1999, pp. 1350–1352; Davis et al. 2007, pp. 2202–2208; Buskirk et al., 2010, p. 10). These variables are assumed to be surrogates for habitat conditions or features that are not easily measured but may influence the distribution of fishers or their use of various habitats. For example, elevation, aspect, and topography are frequently correlated with floristic changes due to gradients in precipitation and temperature. Such changes in forest structure are expected to influence forest productivity and prey species composition. The effectiveness of abiotic variables in predicting fisher occurrence may also be related to past management activities and not truly related to fisher habitat selection and fitness. For example, terrain ruggedness has been a component of some models predicting fisher occurrence (Davis et al. 2007, pp. 2202–2203); however, in some areas, remote rugged terrain has been less subject to timber harvest and other management activities.

A more extensive review of fisher habitat can be found in Lofroth et al. (2010, pp. 81–121).

Historical Range/Distribution:

At the time of European settlement (ca. 1600), fishers were presumably found in forests across North America from approximately 60° north latitude in southern Yukon and Labrador in Canada, extending south into the United States along the Appalachian, Northern Rocky, and Pacific Coast Mountains (Gibilisco 1994, p. 60). In the late 1800s and early 1900s, fishers experienced reductions in range, decreases in population numbers, and local extirpations attributed to over-trapping, predator control, and habitat destruction in the United States, and to a lesser extent in Canada (Brander and Books 1973, p. 53; Douglas and Strickland 1987, p. 512; Powell and Zielinski 1994, p. 39).

At the beginning of the 20th century in the Pacific States and Provinces, the fisher's range and distribution was "broadly distributed," but "generally rare" (Lofroth et al. 2010, p. 39). Hagmeier (1956, p. 152) reported fishers to be "common throughout most of the forested regions" of British Columbia apparently supporting a regular fur harvest across 90 percent of the province (Rand 1944, p. 79). In Washington, fisher historically occurred throughout densely forested areas both east and west of the Cascade Crest, the Olympic Peninsula, and probably in southwestern and northeastern Washington (Aubry and Houston 1992, pp. 69–70; Lewis and Stinson 1998, pp. 4–5). In Oregon, Bailey (1936, pp. 298–299) reports fishers occurred in the boreal forest zones of the Cascade Range from Washington to California, west to the coniferous coastal forests and cool humid Coast Ranges and extends their range to the northeastern portion of the state near the Washington and Idaho borders. In the forested, higher mountain masses of California, Grinnell et al. (1937, pp. 214–215) describe fishers as ranging from the Oregon border southward through the Coast Range to Lake and Marin Counties, east through the Klamath Mountains to Mount Shasta, and south throughout the main Sierra Nevada to Greenhorn Mountain in northern Kern County. Contrary to Grinnell's "assumed general range" (Grinnell et al. 1937, p. 216) depicting a relatively continuous population, recent genetic research led Knaus et al. (2011, p. 11) to hypothesize the population currently occurring in the southern Sierra Nevada may have become isolated prior to European influences.

The reduction in range and distribution of fishers in the late 1800s and early 1900s resulted in a retraction in all Provinces except the Northwest Territory and Yukon Territories in Canada (Lewis et al. 2012, p. 11) and remnant populations in the United States occurring only in Maine, Minnesota, New Hampshire, New York, and in the Pacific States (Powell and Zielinski 1994, p. 41). Since the 1950s, fishers have recovered in some of the central (Minnesota, Wisconsin) and eastern (New England) portions of their historical range in the United States as a result of trapping closures, habitat regrowth, and reintroductions (Brander and Books 1973, pp. 53–54; Powell 1993, p. 80; Gibilisco 1994, p. 61; Lewis and Stinson 1998, p. 3; Proulx et al. 2004, pp. 55–57). Fishers are wandering into Virginia from West Virginia in the Appalachian Mountains, but it is unclear if they are establishing reproductive populations (Virginia DGIF 2012).

Current Range Distribution:

We used various sources of information to describe the current distribution of fishers in the DPS. The U.S. Department of Agriculture Forest Service's Forest Carnivore Surveys in the Pacific States website (Forest Carnivore Surveys in the Pacific States 2012) provides a permanent archive and retrieval system for data from standardized forest carnivore surveys conducted in the Pacific states, regardless of their success or failure to detect target species. This database contains the most comprehensive, publicly available compilation of verified detections for fishers. It is still a relatively new effort, however, and regular use has not become widespread amongst both private and public land managers conducting forest carnivore surveys. Consequently, we supplemented the records in this database with published and unpublished literature and other records when we knew additional information existed.

In its western range, fishers occupy much of their historical range in British Columbia, except in the southern portion of the province, where the population status is uncertain, and may no longer be contiguous with extant populations in Idaho, Montana (76 FR 38508–38514; June 30, 2011), or the Pacific States (Lofroth et al. 2010, pp. 41–43; Lewis et al. 2012, p. 11). In Washington, due to a lack of recent sightings or trapping reports, the fisher was considered to be extirpated or reduced to scattered individuals (Lewis and Stinson 1998, p. 36). Individuals reintroduced in 2008 again represent the species in the state on the Olympic Peninsula (Lewis and Happe 2008, entire), but successful establishment of this population will not be known for several years.

Based on wide-ranging camera and track plate surveys, Aubry and Lewis (2003, p. 86) concluded that the range of fishers is greatly reduced in Oregon. After an extensive inquiry and review of records, Aubry and Lewis (2003, p. 86) found that extant fisher populations in Oregon are restricted to two disjunct and genetically isolated populations in the southwestern portion of the State; one in the southern Cascade Range and one in the northern Siskiyou Mountains of southwestern Oregon. The fishers in the Southern Oregon Cascades population are the decedents from reintroduction efforts that occurred in 1961 and from 1977 to 1981 (Aubry and Lewis 2003, pp. 82–85, 87; Drew et al. 2003, p. 57, 59). The fisher population in the Siskiyou Mountains near the California border appears to be an extension of the indigenous northern California population (Aubry and Lewis 2003, pp. 87–88).

For current distribution of the Southern Oregon Cascades population, we considered verified locations (Stephens 2006; Forest Carnivore Surveys in the Pacific States 2012) and information collected during a 6-year telemetry effort on that population (Aubry and Raley 2006, p. 5). The Southern Oregon Cascades population occurs in portions of Douglas, Jackson, and Klamath Counties with verified detections from near Lemolo Lake in the north, to Hyatt Reservoir in the south.

Substantial efforts have been made to assess the status of fisher and other forest carnivores in California and southern Oregon using systematic grids of baited track and camera stations (Zielinski et al. 1995, entire; 1997a, entire; 1997b, entire; 2000, entire; 2005, entire; 2010, entire; Zielinski and Stauffer 1996, entire; Slauson and Zielinski 2007, entire). Surveys indicate that fishers appear to occupy less than half of the range in California that they did in the early 1900s (Zielinski et al. 1995, p. 108; 2005, p. 1394). The fisher population in California was divided into two populations, one in northwestern California and southern Oregon and the other in the southern Sierra Nevada. These populations were separated by approximately 420 km (260 mi) (Zielinski et al. 1995, pp. 107–108; 2005, p. 1394) until the 2009 reintroduction into the northern Sierra Nevada (see below).

For the current distribution of the Northern California-Southwestern Oregon population, we considered all verified fisher locations (Beyer and Golightly 1996, p. 18; Dark 1997, p. 31; Carroll et al. 1999, p. 1347; Zielinski et al. 2000, p. 28; 2010, pp. 41,47; Slauson and Zielinski 2001, p. 12; Hamm et al. 2003, p. 203; Slauson et al. 2003, p. 20–21; Farber and Criss 2006, p. 11; Lindstrand 2006, p. 49, 2010, p. 18; Slauson and Zielinski 2007, p. 19; Forest Carnivore Surveys in the Pacific States 2012) and telemetry research studies conducted between 1977 and 2011 (Buck et al. 1979, p. 171; Self and Kerns 2001, p. 24; Zielinski et al. 2004b, p. 652; Yaeger 2005, p. 4; 2008; Self and Callas 2006, p. 10, Clayton 2011). The Northern California-Southwestern Oregon fisher population occurs from Josephine, Jackson, and Curry Counties in Oregon to the Oregon-California border. At the Oregon and California border, the fisher population extends from Del Norte and Siskiyou Counties east to Interstate 5; east and west of Interstate 5 in Shasta and southern Siskiyou Counties; and Humboldt, Trinity, western Tehama, northeastern Mendocino, western Glenn, northern Lake, and western Colusa Counties.

For current distribution of the southern Sierra Nevada population, we considered all verified locations (Zielinski et al. 2005, p. 1394; Green 2007, p. 31; Spencer et al.2008, p. 44; Sweitzer and Barrett 2010; Forest Carnivore Surveys in the Pacific States 2012). The current extent of occurrence of the southern Sierra Nevada population in California includes portions of Mariposa, Madera, Fresno, Tulare, and Kern Counties. This population currently occupies the west slope of the southern Sierra Nevada from the Merced River drainage in Yosemite National Park, south through the Greenhorn Mountains at the southern extent of the Sierra Nevada.

A more extensive review of fisher distribution can be found in Lofroth et al. (2010, pp. 47–50).

Reintroduced Populations:
Olympic Peninsula, Washington
The Washington Department of Fish and Wildlife (WDFW), in cooperation with the Olympic National Park, US Geological Survey, and others, began to reintroduce fishers onto Park Service lands on the Olympic

Peninsula in Washington in January 2008 (Lewis and Happe 2008, p. 7). Three years of planned reintroductions were complete at the end of the 2010 trapping season with a total of 90 fishers (40 males and 50 females) relocated from British Columbia to the Park (Lewis et al. 2011, p. 4). These fishers will be monitored for a number of years to determine both the extent of their distribution and success in establishing a reproducing population of fishers on the Olympic Peninsula. Successful establishment of this population will not be known for several years.

Southern Oregon Cascades, Oregon

The fishers in the Southern Oregon Cascades population are British Columbia and Minnesota decedents from reintroduction efforts that occurred in 1961 and from 1977 to 1981 (Aubry and Lewis 2003, pp. 82–85, 87; Drew et al. 2003, p. 57, 59). This population appears to be persisting without additional documented augmentations, however, it does not appear to be expanding its range (Lofroth et al. 2010, p. 48). The Southern Oregon Cascades population is separated from known populations in British Columbia by more than 650 km (400 mi) (Aubry and Lewis 2003, p. 88). No genetic exchange has been documented (Aubry et al. 2004 p. 214; Drew et al. 2003, p. 59; Wisely et al. 2004, p. 646; Farber et al. 2010, p. 12) between the non-native Southern Oregon Cascades population and the native Northern California-Southwestern Oregon population even throughout these populations are relatively close (verified locations of fishers (Farber and Criss 2006, p. 11; Stephens 2006; Clayton 2011) occur within 30 km (12 mi) of one another).

Northern Sierra Nevada, California

The California Department of Fish and Game (CDFG), in cooperation with the U.S. Fish and Wildlife Service (USFWS) and Sierra Pacific Industries, began to translocate fishers to the northern Sierra Nevada in December 2009 (CDFG 2010, p. 79). Three years of planned reintroductions were complete in December 2011 (Facka 2011, pers. comm.) with a total of 40 fishers (16 males and 24 females) relocated from northwestern California to the northern Sierra Nevada in the vicinity of Butte and Plumas Counties (Callas and Figura 2008, entire). These fishers will be monitored for 7 years to determine both the extent of their distribution and the success in establishing a stable reproducing population of fishers in the northern Sierra Nevada (Callas and Figura 2008, p. 65). Successful establishment of this population will not be known for several years.

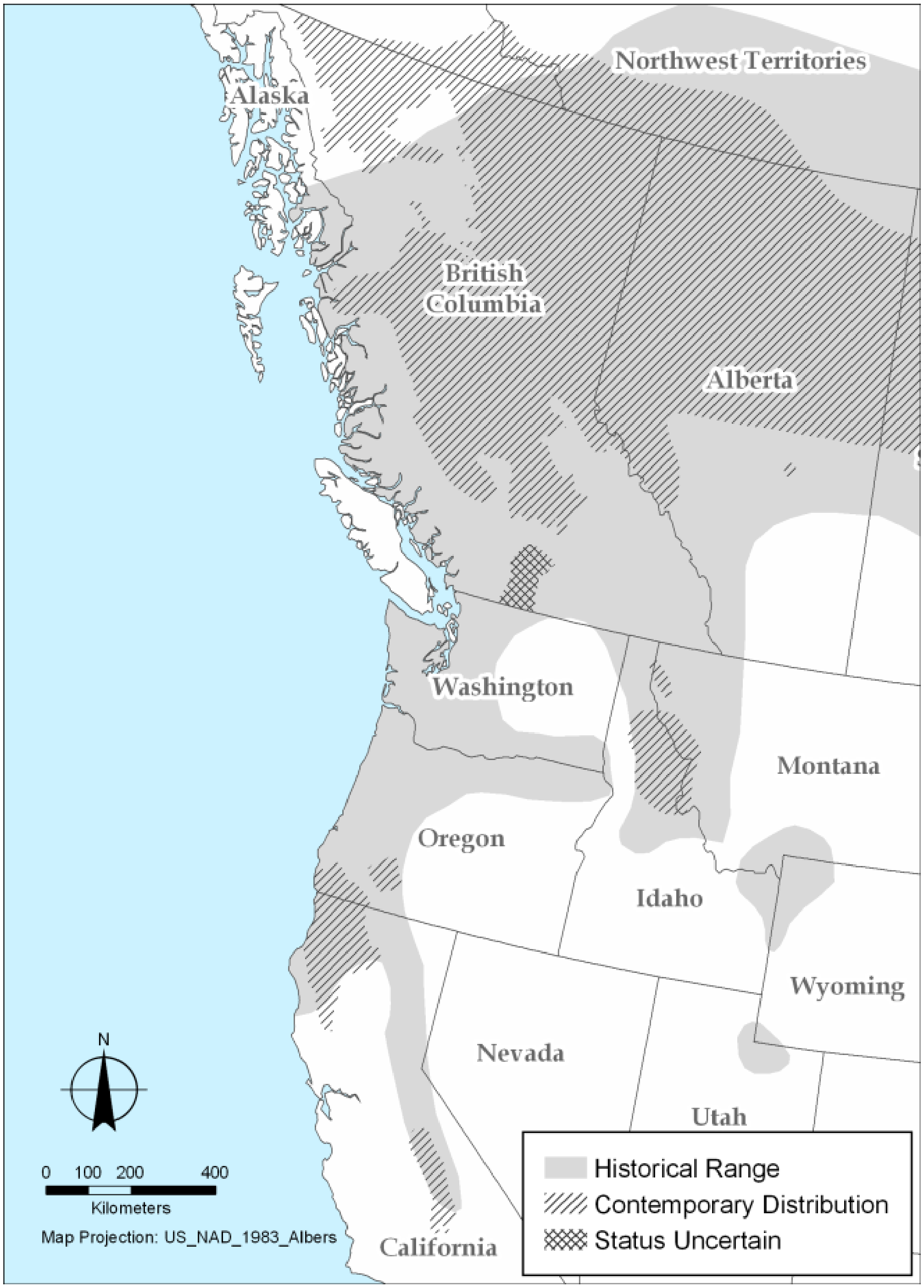

Figure from Lofroth et al. (2010, p. 47). Contemporary range of fishers in western North America based on available information from occurrence records, surveys, research studies, and professional expertise. The contemporary range as depicted does not imply that fishers are present everywhere within the mapped area or are equally distributed throughout the mapped area.

Population Estimates/Status:

Estimates of fisher abundance and vital rates (for example survival, reproduction) are difficult to obtain (Douglas and Strickland 1987, p. 522) and may vary widely based on habitat composition and prey availability (York 1996, p. ix). In addition, the assumptions for estimating fisher populations based on trapping success may not be valid for many methods (Powell and Zielinski 1994, p. 43). Consequently, there are only a few estimates of fisher population densities from specific study areas in the Pacific States and British Columbia.

In British Columbia, in the highest quality habitats in the province, densities of fisher were estimated to be between 1.0 and 1.54 fisher per 100 km^2 (38.6 mi^2) (Weir 2003, p. 20). Using the area of each habitat capability ranked within the extent of occurrence of fisher in British Columbia, the late-winter population for the province was cautiously estimated to be between 1,113 and 2,759 fishers (Weir 2003, p. 20). Between 1996–2000, Weir and Corbould (2006, p. 124) estimated fisher densities on an industrial forest in central British Columbia to range from 0.88 ± 0.11 to 1.12 ± 0.21 fishers per 100 km^2 (38.6 mi^2).

Although no peer-reviewed or published density estimates are available for the entire Northern California-Southwestern Oregon population, there are several estimates for individual study areas (Zielinski et al. 2004b, p. 654; Thompson 2008, entire; Matthews et al. 2011, entire) and one for the entire Northern California-Southwestern Oregon population (Self et al. 2008, entire). Zielinski et al. (2004b, p. 654) provided a rough estimate of approximately five female fishers per 100 km^2 (38.6 mi^2) for their 400 km^2 (154 mi^2) north coast study area (Six Rivers and Shasta-Trinity National Forests of southeastern Humboldt and southwestern Trinity Counties, California. Using capture-mark-recapture techniques, Matthews et al. (2011, p. 72) reported density estimates (and 95 percent confidence intervals) of 52 (43–64) fishers per 100 km^2 (38.6 mi^2) in 1998, and 14 (13–16) fishers per 100 km^2 (38.6 mi^2) in 2005 on the Hoopa Valley Indian Reservation in the Klamath Mountain Range (eastern Humboldt County, California). Because monitoring did not occur between these two time periods, the authors speculated that this 73 percent decline may have been a result of decreased prey availability due to changes in prey habitat, increased predator densities, disease, or some combination of these (Matthews et al. 2011, pp. 72–73). Higley and Matthews (2009, p. 22) report that the 2005 study may have begun when the local population was rebounding from an unknown devastating effect, but an increasing lambda estimate and shift in age structure since then indicate the population is showing signs of stability or increase. It remains unclear, however, if this was a localized decline in what may have been temporally a very dense population in 1998 on the Hoopa Reservation, or something occurring over a larger geographic area. Fisher surveys on adjacent land owned by industrial timber landowner, Green Diamond Resource Company (Humboldt County, California), did not detect any dramatic declines over a similar time period (Diller 2008), suggesting the Hoopa observations may have been localized. In a 2002–2003 density study on Green Diamond Resource Company property, Thompson (2008, p. 23) reported a mean density estimate of 7 ± 1 to 11 ± 2 fishers per 100 km^2 (38.6 mi^2) using mark-resight techniques. Using a deterministic-expert approach that related density estimates derived for individual study areas to biotic features and applied this relationship uniformly across the population, Self et al. (2008, p. 5) estimated that 4,616 fishers occur in the Northern California-Southwestern Oregon population.

Density estimates are available for the Southern Sierra Nevada population at the study site level (Zielinski et al. 2004b, p. 654; Jordan 2007, pp. 12–44), the population level (Lamberson et al. 2000, p. 2; Spencer et al. 2011, entire), and one preliminary occupancy trend estimate (Truex et al. 2009). Zielinski et al. (2004a, p. 654) provided a rough estimate of approximately 8 females per 100 km^2 (38.6 mi^2) in their 280 km^2 (108 mi^2) southern Sierra Nevada study area (Sequoia National Forest, Tulare County, California). From a 3 year camera trapping study, Jordan (2007, p. 25) reported density estimates (95 percent confidence intervals) of 13.4 (7.6–24.2), 9.5 (5.6–17.0), and 10.0 (6.7–14.4) fishers per 100 km^2 (38.6 mi^2) in 2002, 2003, and 2004, respectively, in the southern Sierra Nevada (Sierra National Forest, Fresno County, California).

For the purpose of modeling population viability, Lamberson et al. (2000, p. 2) used expert opinion to estimate that there are between 100 and 500 individuals in the Southern Sierra Nevada population. Self et al. (2008, p. entire) estimated 598 fishers using a deterministic-expert approach and predicted 548 +/- 181 (SE) individuals with a regression approach for the southern Sierra Nevada population. Spencer et al. (2011, p. 801) used a spatially explicit population model coupled with a fisher probability of occurrence model to estimate the size of the Southern Sierra Nevada population and concluded that the population size was probably less than 300 adult fishers. Spencer et al. (2011, p. 788) also estimated the carrying capacity of the currently occupied areas to be approximately 125–250 adults.

In 2002, the USDA Forest Service (USFS) initiated a regional monitoring program to track population trends in the Sierra Nevada. Occupancy modeling techniques were used to assess the effects of various survey and ecological characteristics on detection probabilities and occupancy rates. Fishers have been detected at 23–27 percent of sites annually (2002–2009), with the majority of detections occurring in mid-elevation forested habitats (Truex 2009). Preliminary analysis suggests no decline in the index of abundance across the population during the monitoring period, though occupancy rates appear to vary among geographic regions within the population (Truex 2009).

Based on trapping records from the 1920s, Grinnell et al. (1937, p. 227) provided an estimate of 1 fisher per 100 mi^2, equating to 300 fishers in California. The Grinnell et al. population estimate for California is incorrect by modern standards due to the lack of a significant sample size, survey bias, and inadequate knowledge of the historical baseline, although they employed accepted methodologies at the time they conducted their research.

Despite the lack of precise empirical data on fisher numbers in the DPS, the reduction in the range of fisher on the west coast, as indicated by the lack of detections or sightings over much of its historical range, and apparent isolation from the main body of the species range (Drew et al. 2003, p. 59; Wisely et al. 2004, p. 646; Knaus et al. 2011, p. 11, Lewis et al. 2012, p. 11), the extant fisher populations are small relative to our understanding of their historical distribution.

Distinct Population Segment(DPS):

Under the Endangered Species Act (Act), we must consider for listing any species, subspecies, or, for vertebrates, any Distinct Population Segment (DPS) of these taxa, if there is sufficient information to indicate that such action may be warranted. To interpret and implement the measures prescribed by the Act and its Congressional guidance, we and the National Marine Fisheries Service (National Oceanic and Atmospheric Administration - Fisheries), developed a joint policy that addresses the recognition of DPSs of vertebrate species for potential listing actions (61 FR 4722). The policy allows for a more refined application of the Act that better reflects the biological needs of the taxon being considered, and avoids the inclusion of entities that do not require its protective measures.

The DPS policy specifies that we are to use three elements to assess whether a population segment under consideration for listing may be recognized as a DPS:
(1) the population segment's discreteness from the remainder of the species to which it belongs;
(2) the significance of the population segment to the species to which it belongs; and
(3) the population segment's conservation status in relation to the Act's standard for listing.

Our evaluation of significance is made in light of Congressional guidance that the authority to list DPS's be used "sparingly" while encouraging the conservation of genetic diversity. If we determine that a population segment meets the discreteness and significance standards, then the level of threat to that population segment is evaluated based on the five listing factors established by the Act to determine whether listing the DPS as either threatened or endangered is warranted.

Below, we address under our DPS policy the population segment of the fisher that occurs in the western United States in Washington, Oregon, and California. The area for this DPS includes the Cascade Mountains and all areas west to the coast in Oregon and Washington. In California, the DPS includes the North Coast from Mendocino County north to Oregon, east across the Klamath-Siskiyou, Trinity, and Marble Mountains, across the southern Cascade Mountains and south through the Sierra Nevada. The mountainous areas east of the Okanogan River in Washington and the Blue Mountains west to the Ochoco National Forest in eastern Oregon are not included in this DPS due to naturally occurring geographical conditions that isolate the area described above from the remainder of the DPS in Oregon and Washington.

Discreteness

Under our DPS policy, a population segment of a vertebrate species may be considered discrete if it satisfies either one of the following two conditions:

(1) it is markedly separated from other populations of the same taxon as a consequence of physical, physiological, ecological, or behavioral factors (quantitative measures of genetic or morphological discontinuity may provide evidence of this separation); or

(2) it is delimited by international governmental boundaries within which differences in control of exploitation, management of habitat, conservation status, or regulatory mechanisms exist that are significant with regard to conservation of the taxon in light of section 4(a)(1)(D) of the Act (61 FR 4722).

The proposed DPS is markedly separated from other fisher populations as a result of several factors. Native populations of fishers in California and the reintroduced population in the Southern Oregon Cascades are isolated from the Canadian populations due to the apparent extirpation of fishers in Washington and northern Oregon (Aubry and Lewis 2003, entire) and the northward contraction of the fisher's distribution in British Columbia (Weir 2003, pp. 17–19). Estimates of the distance separating these populations are now approximately 800 km (497 miles). Substantial information is available indicating the West Coast population is also physically separated from known populations of fishers to the east in the Rocky Mountains. The potential range of fishers on the east side of the Cascades in Washington is separated from the fisher's range in the Rocky Mountains, in the United States, by the Okanogan and Columbia River Valleys. The Washington, Oregon, and California fisher populations are separated from the rest of the taxon in the central and eastern United States by natural physical barriers which include the plains of the Midwest, and the non-forested high desert areas of the Great Basin in Nevada and eastern Oregon. The shortest distance between the Southern Oregon Cascades fisher population in the west and in the Rocky Mountains is approximately 600 km (373 mi) across grasslands and wheat farms of eastern Washington and the northern Great Basin desert. Fishers have a strong aversion to areas lacking in forest cover (Powell 1993, pp. 92–93, 165–166; Aubry and Lewis 2003, p. 88). These behavioral factors represent a significant impediment to interaction between the West Coast population and fishers known to occur in the Rocky Mountains and central and eastern United States.

Although fishers appear to be capable of moving widely throughout the landscape (York 1996, p. 56; Aubry and Raley 2006, p. 14; Weir and Corbould 2008, p. 48), they may have relatively poor dispersal capabilities (Kyle et al. 2001, pp. 2345–2346; Aubry et al. 2004, p. 214). The ability of fishers to move through the landscape is affected by many factors including suitable cover, prey resources, mortality risk, and the presence of conspecifics (Weir and Corbould 2008, p. 34).

Limited information exists for juvenile dispersal distances, a key factor in assessing the risk of isolated populations. Typically measured as the distance between an individual's natal and subsequent home range, mean juvenile dispersal distances have been reported in the eastern United States at two study areas. In a Maine population with high trapping mortality and low density, Arthur et al. (1993, pp. 871–872) reported average maximum dispersal distances for females of 14.9 km (9.3 mi) (range = 7.5–22.6 km (4.7–14.0 mi); n = 5) and males of 17.3 km (10.7 mi) (range = 10.9–23.0 km (6.8–14.3 mi); n = 8). In a high-density Massachusetts population, York (1996, p. 56) reported an average minimum dispersal distances for females of 37 km (23 mi) (range = 12–107 km (7.5–66.5 mi); n = 19) and males of 25 km (15.5 mi) (range = 10–60 km (6.2–37.3 mi); n = 10).

In the western North America, juvenile dispersal may be male-biased. In north-central British Columbia, Weir and Corbould (2008, p. 44) reported mean dispersal distances for females of 16.7 km (10.4 mi) (range = 0.7–32.7 km (0.4–20.3 mi); n = 2) and males of 41.3 km (25.7 mi; n = 1), respectively. In the Cascades Range of southern Oregon, Aubry and Raley (2006, p. 14) reported mean dispersal distances females 6 km (3.7 mi) (range = 0–17 km (0–10.6 mi); n = 4) and males of and 29 km (18 mi) (range = 7–55 km (4.3–34.2 mi); n = 3), respectively. In northern California Matthews et al. (2009, p. 10) reported mean dispersal distance for females and males of 6.3 km (3.9 mi) (range = 1.0–18.0 km (0.6–11.2 mi); n = 4) and 1.3 km (0.8 mi; n = 1), respectively.

Based on genetic information, the West Coast population of fishers was originally colonized from British Columbia (Drew et al. 2003, p. 59). The current distribution of fishers in British Columbia has contracted northward and connection to fisher populations in the continental United States no longer exists (Weir 2003 pp. 17–19; BC Species and Ecosystems Explorer 2003). Movement of fishers from British Columbia southward through Washington, to areas known to be occupied by fishers in Oregon is not possible due to very long distances and the dispersal behavior of fishers. In the winters of 2008 through 2010, 90 fishers from British Columbia were reintroduced to the Olympic Peninsula of Washington (Lewis et al. 2011, p. 4). Even if this reintroduction is successful, the distance to fisher populations in southern Oregon is still extensive and the population on the Olympic Peninsula will be isolated from the populations in British Columbia and the Cascade Range by urban development in the Seattle area.

The fisher is regarded as a habitat specialist in the western United States (Buskirk and Powell 1994, entire). Fishers on the west coast occur primarily in mid- to lower-elevation conifer and mixed conifer-hardwood forests characterized by dense canopies and abundant large trees and snags (with cavities), and logs (Lofroth et al. 2010 pp. 81–121). The majority of conifer forest habitat in British Columbia is characterized as boreal forest, which is different from the forest and environmental conditions associated with Washington, Oregon, and California. In contrast, fishers in the northeastern United States and the Great Lakes region inhabit areas with a large component of deciduous hardwood forest containing *Fagus grandifolia* (American beech), *Acer saccharum* (sugar maple), and other broadleaf species (Powell 1993, p. 56).

The apparent differences in the fishers' association with forest habitats on the west coast from eastern and northern habitats may be due to the west's unique climate influenced by the extended, warm, dry summers. Western fishers may select rest sites and structures with cavities that minimize the effects of heat and dryness (Zielinski et al. 2004a, p. 488). Zielinski et al. (2004a, p. 488) state that, "Perhaps fishers in the east find less need for the protection from heat and water loss that cavities in old-growth trees provide because summer habitats are not subject to the persistent hot and dry conditions."

With regard to physiological differences, fishers in the native Northern California-Southwestern Oregon population are significantly smaller in size (based on condylobasal length) than fishers from western and central Canada (Hagmeier 1959, p. 190; Aubry and Lewis 2003, p. 87). Both male and female fishers from the Klamath-Siskiyou region in northwestern California weighed significantly less than those from the reintroduced population (largely descendants of fishers from British Columbia) in the southern Cascade Range in Oregon (Aubry and Lewis 2003, p. 87).

Substantial information now indicates that the closest fisher population in the northern Rocky Mountains is genetically unique from the fishers in the West Coast population. This information suggests that there is a relic native population in the Rocky Mountains (Drew et al. 2003, p. 59; Vinkey et al. 2006, p. 267; Schwartz 2007, p. 922) that contains haplotypes unique to, and distinct from, the West Coast population.

Information pertaining to the second criterion for discreteness suggests that the West Coast population of fishers is delimited to the north by the international governmental boundary between the United States and Canada due to differences in exploitation, management of habitat, conservation status, and regulatory mechanisms that may be significant with respect to section 4(a)(1)(D) of the Act. Lands within the National Forest System in the United States are considered under the National Forest Management Act of 1976, as amended (16 U.S.C.§1600), and its associated planning regulations. Lands managed by the Bureau of Land Management (BLM) are managed under the Federal Land and Policy Management Act (FLPMA 43 U.S.C.§1712). Canada has no overarching forest practice laws governing management of its national lands similar to NMFMA and FLPMA. Fishers are covered by British Columbia's Wildlife Act, which protects virtually all vertebrate animals from direct harm, except as allowed by regulation (for example hunting or trapping). The fisher is designated as a Class 2 furbearer in British Columbia and, as such, can be legally harvested by licensed trappers under regional regulations. The fisher's current provincial status is "Blue" with a conservation ranking of "S2/S3," as assigned by the BC Conservation Data Centre (2012). A "Blue" listing status includes any indigenous species or subspecies considered to be of Special Concern in British

Columbia. Taxa of Special Concern have characteristics that make them particularly sensitive or vulnerable to human activities or natural events. Blue-listed taxa are at risk, but are not Extirpated, Endangered, or Threatened. The "S2" rank means the species is considered imperiled at the provincial level and the "S3" rank means the species is vulnerable. The fisher trapping season remains open in portions of British Columbia (BC Ministry of Environment 2012). Trapping the species has been prohibited for decades in Washington, Oregon, and California (Lewis and Stinson 1998, p. 30). For the reasons stated above, we conclude that these factors collectively play a role in delimiting the northern DPS boundary along the international border with Canada.

Based on the available information on fisher range and distribution, we conclude that the West Coast population of fishers is distinct and separate from other fisher populations in the United States, and meets the requirements of our DPS policy for discreteness. The West Coast population of fishers is separated from fisher populations to the east by geographical barriers and urban development. The populations are separated from populations to the north by approximately 800 km (497 mi) and the international boundary with Canada.

Significance to the Species

Under our DPS policy, once we have determined that a population segment is discrete, we consider its biological and ecological significance to the larger taxon to which it belongs. This consideration may include, but is not limited to, the following factors:

(1) persistence of the discrete population segment in an ecological setting unusual or unique for the taxon;
(2) evidence that loss of the discrete population segment would result in a significant gap in the range of the taxon;
(3) evidence that the population segment represents the only surviving natural occurrence of a taxon that may be more abundant elsewhere as an introduced population outside its historical range; and
(4) evidence that the discrete population segment differs markedly from other populations of the species in its genetic characteristics.

Significance is not determined by a quantitative analysis, but instead by a qualitative finding. We have found substantial evidence that the West Coast DPS of the fisher meets three of the significance factors (1, 2, and 4).

The West Coast population of fishers persists in an ecological setting that is unusual in comparison to the rest of the taxon, with a different climate, topography, and habitat than that found in the majority of its range. The forests inhabited by fishers on the west coast lack the extensive broadleaf hardwood component that is common in the eastern portions of the species' range. The Pacific coast's wet winter followed by a dry summer is unique in comparison to climate types in the east, and produces distinctive forests of deciduous and evergreen broad leaved trees, conifers, and shrubs (Smith et al. 2001, p. 17). The climate in the fishers' range in the Rocky Mountains consists of cold winters and cool, dry summers while in the Great Lake States, eastern Canada, and the northeast United States the weather is characterized by cold winters, and warm, wet summers. Fishers on the west coast primarily occur in habitat in mountainous terrain, while those in the Great Lakes region, eastern Canada, and the northeastern United States inhabit level terrain or low lying glaciated mountains. Release of eastern fishers into western forests have generally been unsuccessful; Powell and Zielinski (1994, p. 42) state that "Roy's (1991) results [unsuccessful attempts to reintroduce Minnesota fishers to Montana] indicate that many fishers from eastern North America may lack behaviors, and perhaps genetic background, to survive in western ecological settings." The repeated introductions of fishers from British Columbia and Minnesota to the southern Cascade Mountains of Oregon (from 1960s to 1980s) have resulted in an apparently stable, but small population; however, the species does not appear to be expanding and dispersing from the areas into which it was introduced (Aubry and Lewis 2003, p. 88, Forest Carnivore Surveys in the Pacific States 2012).

The loss of the West Coast DPS of fishers would eliminate the entire southwest portion of the fisher's range, a major geographical portion of the range of the taxon.. Additionally, the West Coast DPS of the fisher represents the southernmost range of the species. The West Coast populations represent three of the known remaining five populations in the western United States, the fourth and fifth being the Rocky Mountain populations in Idaho and Montana. Fishers in the southern Sierra Nevada and Northern California-Southwestern Oregon populations appear to be the only native populations of fishers remaining west of the Rocky Mountains in the United States (Aubry et al. 2004, p.217; Drew et al. 2003, pp. 58–59). In addition, the southern Sierra Nevada and Northern California-Southwestern Oregon populations are the only western United States populations that have not been augmented with individuals (and genes) from other regions (Drew et al. 2003, pp. 58–59).

The extinction of fishers in their West Coast range would also result in the loss of a significant genetic entity, since they have been described as being genetically distinct from fishers in the remainder of North America. While Drew et al. (2003, p. 59) reported the extant native Northern California-Southwestern Oregon population had one haplotype not found in any other population, Knaus et al. (2011, p. 7) reported three haplotypes found exclusively in California. Quantitative measures of genetic discontinuity indicate that there is a marked separation of West Coast fishers from other populations of the taxon, indicating that no natural interchange occurs. Based on genetic evidence, and supported by paleontological and archeological evidence, Wisely et al. (2004, p. 645) theorized that fishers probably colonized the Pacific peninsula from the north, not the east. Fishers were once distributed throughout much of the dense coniferous forests in British Columbia, Washington, Oregon, and California (Drew et al. 2003, p. 59). This historical connectivity among populations along the Pacific Coast is evidenced by the presence of British Columbia haplotypes in museum specimens from California and Washington (Drew et al. 2003, p. 59). Genetic variation shows the Southern Oregon Cascades population is a reintroduced population descended from fishers translocated to Oregon from British Columbia and Minnesota (Drew et al. 2003, p. 58). There is evidence that there has been no genetic interchange between the native Northern California-Southwestern Oregon population and the reintroduced Southern Oregon Cascades population (Aubry et al. 2004 p. 214; Drew et al. 2003, p. 59; Wisely et al. 2004, p. 646; Farber et al. 2010, p. 12).

We have evaluated the population of fishers in their West Coast range as a DPS, and have addressed two of the elements our policy requires us to consider in deciding whether a vertebrate population may be recognized as a DPS and then considered for listing under the Act. In assessing the population segment's discreteness from the remainder of the taxon, we have described the factors separating it from other populations. We considered distributional, ecological, behavioral, morphological, and genetic information, information from surveys, and geographical and biogeographical patterns, and have concluded that this population segment is discrete under our DPS policy.

In assessing the population segment's significance to the taxon to which it belongs, we have considered the geographical area represented by the western DPS, its genetic distinctness from fisher populations in the central and eastern United States, its unique ecological setting, and other considerations and factors as they relate to the species as a whole. We conclude that loss of the species from its West Coast range in the United States would represent a significant loss of the species from a unique ecological setting, loss of the species' range, and the loss of genetic differences from fishers in the Rocky Mountains and eastern United States. Therefore, the population segment meets both the discreteness and significance criteria of our DPS policy.

Threats

A. The present or threatened destruction, modification, or curtailment of its habitat or range:

Changes in forest vegetation from timber harvest, silviculture and fuels reduction treatments, stand-replacing fire, and forest disease outbreaks or insect infestations (for example pine beetle [*Dendroctonus ponderosae*]) can remove, modify, or fragment habitat suitability for fishers if these areas are large or more extensive than the natural pattern and scale of disturbance (Agee 1991, p. 33; 69 FR 18770; Powell and Zielinski 1994, p.

64; Franklin et al. 2002, pp. 7–10, 20–21; Weir and Corbould 2008, pp. 127, 161–162; Wisdom and Bate 2008, pp. 2091–2092; Naney et al. 2012, entire). The magnitude and intensity of past timber harvest is one of the primary causes of fisher decline across the United States (Douglas and Strickland 1987, p. 512; Powell 1993, pp. 77–80, 84; Powell and Zielinski 1994, p. 44), and may be one of the main reasons fishers have not recovered in Washington, Oregon, and portions of California as compared to the northeastern United States (Aubry and Houston 1992, p. 75; Powell 1993, p. 80; Powell and Zielinski 1994, pp. 39, 64; Lewis and Stinson 1998, p. 27; Truex et al. 1998, p. 59).

In the west, studies indicate that fishers appear to use late-successional forests more frequently than early-successional forests (Rosenberg and Raphael 1986, pp. 269–271; Jones and Garton 1994, pp.382–383; Zielinski et al. 2004b, pp. 654–655; Matthews et al. 2008, p. 49; Weir and Corbould 2008, pp. 124–125). Many of these studies also indicate that fisher home ranges were associated with components of earlier successional forests that included structural complexity of the forest floor and shrub and small tree cover, likely due to the abundance of prey resources (Jones and Garton 1994, pp. 383–384; Weir and Harestad 2003, p. 78; Matthews et al. 2008, p. 49; Weir and Corbould 2008, p. 123). Consistent among studies, however, is the fisher’s association with moderate to dense forest canopies, complex forest structure, and many elements of late-successional forest structure (for example down logs, snags, and live trees with cavities and large deformed limbs) (Lofroth et al. 2010, pp. 81–121).

Several studies in Washington, Oregon, and California have found sharp declines in late-successional and old-growth forests (55 FR 26114, June 26, 1990; McKelvey and Johnston 1992, pp. 225–232; Bolsinger and Waddell 1993, p. 2; Forest Ecosystem Management Assessment Team (FEMAT) 1993, pp. 6–8; Franklin and Fites-Kaufmann 1996, p. 648; Beardsley et al. 1999, p. 21). Old growth comprised about 50 percent of forests in Washington, Oregon, and California in the 1930s and 1940s, but made up less than 20 percent (4,168,269 ha (10.3 million acres [ac]) of those forests in 1992 (Bolsinger and Waddell 1993, p. 2). Elimination of late-successional forest from large portions of the Sierra Nevada and Pacific Northwest (Aubry and Houston 1992, pp. 69, 74–75; McKelvey and Johnston 1992, pp. 225–232, 241; Franklin and Fites-Kauffman 1996, p. 648) has probably significantly diminished the fishers’ historical distribution on the west coast (Lewis and Stinson 1998, p. 27).

Franklin and Spies (1986, p. 80) estimated that 6 million hectares (ha) (15 million ac) of old- growth forest existed west of the Cascade Range in Washington and Oregon in the 1800s. Most of the forest (perhaps 80 percent) probably occurred in relatively large contiguous areas (greater than 405 ha (1,000 ac) (Bolsinger and Waddell 1993, p. 2). In western Washington and Oregon, modern estimates suggest that 82–87 percent of the old-growth present at the time of settlement have now been logged (Booth 1991, p. 1).

The conversion of low-elevation forests in western Washington to tree plantations and non-forest uses eliminated a large portion of fisher habitat west of the Cascades (Lewis and Hayes 2004, p. 4). During the last 50 years, the structure, composition, and landscape of much of western Washington's commercial timberlands have significantly changed because of intensive timber harvesting activities (Lewis and Hayes 2004, p. 4). Most of the remaining younger low and mid-elevation forest has reduced amounts of large live trees, snags, and coarse woody material, and is not likely to be able to sustain fisher populations (Lyon et al. 1994, p. 136; Lewis and Stinson 1998, p. 14; Lewis and Hayes 2004, p. 2004).

In California, the pattern of timber harvest has historically differed from harvest patterns in Washington and Oregon (Franklin and Fites-Kaufmann 1996, p. 630). Rosenberg and Raphael (1986, p. 272) emphasize that the fragmentation of northwestern California Douglas-fir (*Pseudotsuga menziesii*) forests is relatively recent in comparison with forests of other regions (redwoods of California and Douglas-fir forests of Washington and Oregon), and that the true long-term responses of species to the break-up of their habitat cannot yet be discerned. Franklin and Fites-Kaufmann (1996, p. 648) found that forests with high late successional and old-growth structural rankings are now uncommon in the Sierra Nevada of California (14 percent of mapped area). Late successional and old-growth forests of mixed conifer are a particularly poorly represented forest type as a result of past timber harvesting, and key structural features such as large-diameter trees, snags, and logs, are generally at low levels (Franklin and Fites-Kaufmann 1996, p. 648). This loss of structurally complex forests have likely played significant roles in both the loss of fishers from the central and northern Sierra Nevada, as well as the fishers failure to recolonize these areas (USFS 2000, p. 5).

The overall loss and fragmentation of habitat may contribute to the decline of fisher populations (Aubry and Lewis 2003, p. 2). Recently completed studies by Weir and Corbould in British Columbia have investigated habitat features at a variety of scales which might influence habitat selection and use by fishers. Weir and Corbould's (2008, p. 121) model that best explained the likelihood of occupancy of a home range by fishers, indicated a negative association with the percentage of the home range composed of non-forested habitats (combination of non-forested wetlands and recent logging).

Habitat components important to a fisher's use of stands and the landscape can be identified broadly as structural elements (for example snags, down wood, live trees with cavities, and mistletoe brooms), overstory cover (dominant, co-dominant, and intermediate trees), understory cover (vertical and horizontal diversity), and vegetation diversity (floristic species) (Lofroth et al. 2010, pp. 119–121). The reduction in, or losses of, these components are outcomes of natural disturbance events (for example wildfire, forest insects, and disease) and various vegetation management activities (for example timber harvest, silvicultural practices, and fuel reduction techniques).

The loss of and reduction in the availability and distribution of structural elements and the processes that create them (for example mistletoe, heart rot fungi, age-related decadence, primary cavity excavators) can negatively affect fisher reproduction and energy budgets (Lofroth et al. 2010, pp. 123–130, Naney et al. 2012, p. 22). Also, in many of the ecosystems in the DPS, these structural elements are important habitat components for fisher prey (Aubry et al. 1991, pp. 292–294; Carey and Johnson 1995, pp. 347–349; Bowman et al. 2000, p. 123). Timber harvest and silvicultural techniques such as regeneration harvest, selective harvest of insect damaged and diseased trees, and thinning to promote vigorous stands of trees, often removes the largest trees or focuses on the removal of older, diseased, or decadent trees resulting in the removal or limited future recruitment of rest and den trees. Fuels reduction and fire suppression techniques that focus on the removal or salvage of snags and fire damaged trees may diminish the distribution, abundance, and recruitment of den and rest sites across the landscape (Naney et al. 2012, pp. 29–37).

Moderate to dense forest cover (both overstory and understory) is positively associated with home range and larger scales (Carroll 1999, pp. 1353, 1357; Zielinski et al. 2004b, p. 653; Carroll 2005, pp. 8–9; Davis et al. 2007, p. 2208; Weir and Corbould 2010, pp. 407–409), and at the landscape scale, cover can affect fisher home range selection (Weir and Corbould 2008, p. 6). A moderate to dense forest overstory provides key habitat functions (for example rest and den sites, snow interception, thermal, and escape cover) and contributes to structural complexity of habitat, both of which are beneficial to fishers and their prey (Lofroth et al. 2010, pp. 81–121). Vegetation management techniques as described in the previous paragraph can substantially modify the overstory canopy and, once removed, it takes many decades to replace the complexity of multi-layer overstory canopy (Franklin and Spies 1991a, p. 71–76; Franklin and Fites-Kaufmann 1996, p. 634–636).

Moderate to dense forest understory vegetation can be provided by small trees and shrubs and also is a component of a structurally diverse stand. It provides cover for hunting and protection from predators and in some ecosystems of the DPS, provides prey habitat (for example woodrats [*Neotoma fuscipes*], snowshoe hare [*Lepus americanus*]) (Sakai and Noon 1993, pp. 379–380; Ausband and Baty 2005, pp. 208–209; Lofroth et al. 2010, pp. 87–102). Understory reduction can result from silvicultural and fuels reduction treatments (for example brushing, pre-commercial thinning, herbicide application); however, the effects to fishers can vary greatly by type, intensity, and scale of treatment (Naney et al. 2012, pp. 29–37). Prescribed burning in the appropriate ecosystems generally promotes forest resiliency and can enhance habitat suitability for fishers and their prey.

Throughout the DPS, fishers occur in a wide variety of forested plant communities (Lofroth et al. 2010, pp.

85–87). In many of these forested plant communities vegetation diversity provides habitat for a wide variety of fisher prey species (Lofroth et al. 2010, p. 87). Vegetation management techniques that do not maintain and promote the diversity of plant communities in which they occur (for example single species tree plantations, removal of hardwoods, harvest of tree species not affected during insect and disease outbreaks) likely diminish the overall habitat suitability and productivity of the landscape for fishers.

The potential for stand-replacing wildfire has increased in areas where fire suppression and regeneration timber harvest have played a role in raising fuel load to levels that place late-successional forest-dependent species at a higher risk of habitat loss (Agee and Skinner 2005, p. 84; Skinner et al. 2006, pp. 178–179; Skinner and Taylor 2006, pp. 202–203; Van Wagtendonk and Fites-Kaufman 2006 p. 271). Stand-replacing fires can impact large areas and render them unsuitable for fishers for several decades (Lewis and Stinson 1998, pp. 34–35, Naney et al. 2012, pp. 31–35). The combination of increased tree density and standing tree mortality (with associated increased surface and ground fuel loads) over the past century presents the greatest single threat to the integrity of Sierra Nevada forest ecosystems (McKelvey et al. 1996, p. 1035; Green et al. 2008, p. 26). On the other hand, while increased density of trees and down wood and logs (fuel loading) increases the risk of stand-replacing fire, they may also enhance habitat for fishers and their prey.

In most cases, the usual pattern of localized outbreaks and low density of insect and disease damaged trees are beneficial, providing structures conducive to rest and den site use by fishers or their prey. Large area-wide epidemics of forest disease and insect outbreaks may displace fishers if canopy cover is lost and salvage and thinning prescriptions in response to outbreaks degrade habitat (Naney et al. 2012, pp. 36). In addressing outbreaks of the mountain pine beetle and other insects in British Columbia, Weir and Corbould (2008, pp. 161–162; 2010, pp. 408–409) state that reduction in overhead cover may be detrimental to fishers, and they state that wide-scale salvage operation may substantially reduce the availability and suitability of remaining forests for fishers. Sudden Oak Death (*Phytophthora ramorum*) in southwestern Oregon and northwestern California is potentially a significant threat if it spreads into areas and causes tree mortality in primary tree species used for fisher den and rest sites or tree species used as primary food sources for fisher prey.

Besides permanently removing potential fisher habitat, human development can disrupt or create barriers to fisher movements. Recreational activities can alter wildlife behavior, cause displacement from preferred habitat, and decrease reproductive success and individual vigor (Green et al. 2008, pp. 27, 29, 44; Naney et al. 2012, pp. 11–13). A study of fisher habitat use on the Shasta-Trinity National Forest indicates that fishers use landscapes with more contiguous, unfragmented Douglas-fir forest and less human activity (Dark 1997, pp. 50–51). In addition, another concern associated with human development and recreation is the potential increase in the incidence of disease in fisher populations, especially those diseases common to domestic dogs (for example canine distemper virus, parvoviruses; Riley et al. 2004, pp. 15–16; Lofroth et al. 2010, p. 66; Naney et al. 2012, p. 35).

Major and state highways may be barriers (either semi-permeable or impermeable) to fisher population-level movements (i.e., home range establishment, juvenile dispersal, breeding season movements by males), as well as sources of vehicle-collision mortality (Truex et al. 1998, pp. 53–54; Sweitzer and Barrett 2010; Naney et al. 2012, pp. 11–15). Campbell et al. (2000, pp. 8, 36) stated that many records of fisher locations come from road kills; for example, Yosemite National Park reported four fishers killed by automobiles between 1992 and 1998. Between 2007 and 2011, 4 of 73 (5%) radio collared fishers were determined to been killed by vehicular strike (Clifford et al. 2012). Roads, highways, and associated developments can substantially influence movement patterns of wildlife (Beier 1995, p. 234). The adverse effects of roads include direct loss of habitat, displacement from noise and human activity, direct mortality, secondary loss of habitat due to the spread of human development, increased exotic species invasion, and barriers that may limit fisher dispersal and home range use (Naney et al. 2012, pp. 16, 22, 25, 36). The impacts of influencing movement patterns on low-density carnivores like fishers are more severe than many wildlife species due to their large home ranges, relatively low fecundity, and low natural population density (Ruediger et al. 1999, p. 7). Disruption of movement can contribute to a loss of available habitat (Mansergh and Scotts 1989, pp. 703–706), isolate populations, and increase the probability of local extinctions (Mader 1984, pp. 93–94).

Fragmentation can be caused by several anthropogenic factors (for example vegetation management, conversion to agriculture, residential construction, and highways) and natural sources, such as large rivers, mountain ridgelines, and valley deserts or grasslands between forested areas (Green et al. 2008, pp. 19, 27, 29; Naney et al. 2012, p. 15). Anthropogenic factors causing fragmentation may degrade suitable habitat by creating patches of unsuitable or less suitable habitat, within which fishers may not be able to forage, find rest and den sites, or travel through, and affect prey species composition, abundance, and availability (Buskirk and Powell 1994, p. 288; Hayes and Lewis 2006, p. 34; Weir and Corbould 2008, p. 148). Fragmentation can also increase energetic costs to fishers which may result in nutritional stress that can reduce animal condition, ultimately affecting survival, reproduction, and recruitment (Lehmkuhl and Ruggiero 1991, pp. 35–44). Predation risk may be increased due to the need to travel through unsuitable habitat (for example lack of cover) or additional travel time needed to circumnavigate unsuitable habitat (Weir and Corbould 2008, p. 31). This may be exacerbated by increased abundance of predators associated with fragmented and early-seral habitats (Lehmkuhl and Ruggiero 1991, pp. 38–39). Fragmentation from timber harvest or fire (depending on harvest method, fire intensity, and site potential) range in time from one fisher lifetime (about 10 years) in forested systems that regenerate quickly to more than 60–80 years (Agee 1991, p. 32; Franklin and Spies 1991b, p. 108).

Climatic factors such as temperature, precipitation, and wind patterns are among many factors that influence vegetation structure and composition (Aldous et al. 2007, entire). Changes in distribution and abundance of dominant plant species in some ecosystems may occur, which would be expected to affect the distribution and abundance of fishers within the DPS (Naney et al. 2012, pp. 22–23). A warming climate will likely result in extended fire seasons with more areas burned (McKenzie et al. 2004, pp. 897–898) and has already had direct effects on forest insect infestations (Carroll et al. 2003, pp. 223–232; Taylor and Carroll 2003, pp. 41–56). Whether the effects of long-term climate change on vegetation composition and structure will result in either a net positive or net negative effect on fishers is unclear (Safford 2007, pp. 8–12).

In conclusion, habitat loss, modification, and fragmentation appear to be significant threats to fishers (Naney et al. 2012, pp. 29–31). Forested habitat in the Pacific coast region decreased by about 3.4 million ha (8.5 million ac) between 1953 and 1997 (Smith et al. 2001, p. 65; Alig et al. 2003, p. 57). Forest cover along the Pacific coast is projected to continue to decline through 2050 in Washington, Oregon, and California, with timberland area projected to be about 6 percent smaller in 2050 than in 1997 (Alig et al. 2003, p. 57). Human population and income are expected to promote development in the region, as the population is projected to increase at rates above the national average, leading to more conversion of forest to non-forest uses (CDFG 2010, pp. 52–53). Given patterns of human population growth and recreational use of the forest in areas near and within fisher habitat, road development, traffic, and its associated mortality, are expected to increase. Changes to habitat structure and loss of important habitat elements continue to occur as a result of forest management practices and stand replacing wildfire and can be expected as a long term result of climate change. All of the above factors allow us to predict that habitat suitable for maintaining fisher populations will decline in Washington, Oregon, and California in the future.

B. Overutilization for commercial, recreational, scientific, or educational purposes:

The fisher was commercially trapped since the early 1800s. Although exact numbers are unknown, trapping caused a severe decline in fisher populations. Aubry and Lewis (2003, p. 81) state that over-trapping appears to have been the primary initial cause of fisher population losses in the Pacific States. The high value of the pelts, the ease of trapping fishers (Powell 1993, pp. 19, 77), year-round accessibility in the low to mid-elevation coniferous forests, and the lack of trapping regulations resulted in heavy trapping pressure on fishers in the late 1800s and early 1900s (Aubry and Lewis 2003, p. 89).

In 1936, noting that fishers had disappeared from much of their former range in Washington, Oregon, and other states (USDA 1936, pp. 1–2), the Chief of the U.S. Biological Survey urged the closing of the hunting and trapping season for 5 years to save fishers and other furbearers from joining the list of extinct wild animals. Commercial trapping of fishers has been prohibited in Washington since 1933 (Lewis and Stinson 1998, p. 22), Oregon since 1937, and in California since 1946 (Aubry and Lewis 2003, p. 86). Where trapping is legal in other states and in Canada, it is a significant source of mortality. Krohn et al. (1994, p. 139), for example, found that over a 5-year period, trapping was responsible for 94 percent (n = 47 of 50) of all mortality for a population of fishers studied in Maine. In British Columbia, the fisher is classified as a furbearing mammal that may be legally harvested; however, the trapping season for fishers has been closed in portions of the Province until it can be determined that the population can withstand trapping pressure (British Columbia Ministry of Environment 2009, p. 93).

Although it is currently not legal to intentionally trap fishers in Washington, Oregon, and California, they are susceptible to incidental capture in traps set for other species (Earle 1978, p. 88; Luque 1983, p. 1; Lewis and Zielinski 1996, pp. 293–295). In all three states it is legal to harvest many mammals that are found in fisher habitat, including bobcat (*Lynx rufus*), gray fox (*Urocyon cinereoargenteus*), coyote (*Canis latrans*), mink (*Mustela vison*), and other furbearers. Red fox (*Vulpes vulpes*) and marten (*Martes americana*) may also be trapped in Washington and Oregon.

Incidental captures in body-gripping or leg-hold traps often result in crippling injury or mortality (Strickland and Douglas 1984, p. 3; Cole and Proulx 1994, pp. 14–15). However, it is no longer legal to use any body-gripping traps in Washington or California. Although data is not available to determine incidental trapping related injury or mortality from non-body gripping traps in these states, the use of box traps suggests most trapped fisher should now be released unharmed. Any captured fisher must be reported in Oregon. Incidental captures in Oregon accounted for five known incidental captures of fishers since 1975, two of these resulting in mortality. It is unknown how many fishers may be illegally harvested in each state.

With this limited information, it appears that current mortalities and injuries from legal incidental capture of fishers in body gripping or leg-hold traps are infrequent. In summary, information available suggests that although historical trapping may have caused a severe population decline, trapping closures and other furbearer management methods that have been in place now for many decades have reduced, but not eliminated, the threat of deleterious population effects due to trapping.

C. Disease or predation:

Specific information on disease in fishers and its potential effects on wild populations is limited. A report on pathogens associated with fishers in northwestern California, (Brown et al. 2007, entire), is the first study of disease in fishers within the range of the West Coast DPS. Brown et al. (2007, pp. 5–6) and ongoing work in the range of the DPS and British Columbia (Gabriel 2010) reported that viruses associated with fishers included: rabies virus (Family *Rhabdoviridae*); canine distemper virus (*Mobillivirus* sp.); parvoviruses; canine adenovirus (the cause of canine infectious hepatitis); and West Nile virus. Brown et al. (2007, pp. 5–6) and Gabriel (2010) also documented the following bacteria: *Anaplasma phagocytophilum*; *Borrelia burgdorferi* sensu lato; and the protozoan *Toxoplasma gondii*. Although the full ecology of canine distemper virus and parvovirus in fishers is not fully understood, both viruses have caused mortality and morbidity in fishers and many other susceptible mustelids (Gabriel 2010). In addition, the protozoan *Toxoplasma gondii* has been documented as a cause of mortality as well as an immunosuppressive pathogen in fishers (Gabriel 2010). In 2009, in an insular population of fishers in the southern Sierra Nevada Mountains in California, an epizootic of distemper virus caused four mortalities within a short period of time (Gabriel 2010).

Studies at the urban-wildland interface suggest a correlation between the prevalence of disease in wild populations and contact with domestic animals (Riley et al. 2004, pp. 18–19). Contact between fishers and domestic dogs and cats, as well as other wild animals susceptible to such diseases (raccoons (*Procyon lotor*), coyotes, martens, bobcats, chipmunks, squirrels, etc.) may lead to infection in fishers. Given some of the preliminary work on community disease transmission in northwestern California, the level of risk to fisher populations at this time is unknown. There is, however, evidence that community species such as sympatric mesocarniovores may be potential spill-over hosts for infections to vulnerable or insular carnivore populations in northern California (Gabriel 2010). Additional research is ongoing in other fisher populations to determine if the findings in northwestern California are unique to the Hoopa Valley Reservation, or adjacent northern California lands where the studies took place (Gabriel 2010). In addition it is important to determine the prevalence of disease factors in fishers and how they may affect fisher population levels or their ability to re-colonize (naturally or via reintroductions) currently unoccupied habitat within their range.

It is unclear how these diseases may affect wild populations of fishers, however, limited information does exist for disease in populations of three other mustelids; the black-footed ferret (*Mustela nigripes*), the marten, and the sea otter (*Enhydra lutris*). These species have experienced outbreaks of various viral, bacterial, fungal, or protozoan diseases. An epidemic of canine distemper virus in black-footed ferret in 1985 led to the extirpation of the species from the wild (Thorne and Williams 1988, pp. 67, 72). Evidence of plague was found in martens in California through detection of plague antibodies and host fleas (Zielinski 1984, pp. 73–74). In a study on sea otter, it was determined that infectious disease caused the deaths of 38.5 percent of the sea otters examined at the National Wildlife Health Center collected in California from 1992–1995 (Thomas and Cole 1996, pp. 2–7).

Mortality from predation could be a significant threat to fishers. Potential predators include mountain lions (*Felis concolor*), bobcats, coyotes, and large raptors (Powell and Zielinski 1994, p. 25; Truex et al. 1998, pp. 80–82; Higley and Matthews 2009, p. 14; Wengert. 2010). It is unknown how many generalist predators such as bobcats and mountain lions inhabit dense mixed coniferous and evergreen forests in the west. They do inhabit various forest types including areas that have been altered (thinning and regeneration harvesting) from forest management. Two ongoing studies in the southern Sierra Nevada population reported that predation was the most common source of mortality of radio-collared fishers (Sweitzer et al. 2011). Wengert et al. (2011) successfully amplified predator DNA (27 of 31 fisher carcasses) from three California study areas. She confirmed bobcats were responsible for 17 predation events, 7 by mountain lions, and 2 by coyote (Wengert et al. 2011). A bobcat was responsible for the one confirmed predated fisher on the Olympic Peninsula Fisher Reintroduction Project (Wengert 2010). Of fisher mortalities recorded by Truex et al. (1998, pp. 80–82), nine were suspected to be from predation. Four fishers out of 7 that died during a study by Buck et al. (1994, p. 373) were killed by other carnivores; the death of one juvenile was suspected to have been caused by another fisher. Powell and Zielinski (1994, pp. 7, 62), Truex et al. (1998, p. 3), and Higley and Matthews (2009, p. 22) report that predation can be a significant source of mortality.

In conclusion, it is uncertain at this time if mortality from disease and predation is a significant threat to the West Coast population of fishers. If disease affects fishers in patterns similar to other mustelids, then there is the potential for disease outbreaks to reduce the size and extent of current fisher populations. Extremely small populations of low-density carnivores, like fishers, are more susceptible to small increases in mortality factors due to their relatively low fecundity, and low natural population densities (Ruediger et al. 1999, pp. 1–2). The southern Sierra Nevada and Southern Oregon Cascades populations are small and isolated from other populations, and therefore may have an increased vulnerability to small increases in mortality factors (Naney et al. 2012, p. 29).

D. The inadequacy of existing regulatory mechanisms:

Existing regulatory mechanisms that could provide some protection for the fisher include:
(1) Federal laws and regulations;
(2) State laws and regulations; and
(3) Local land use processes and ordinances.

However, these regulatory mechanisms have not prevented continued habitat loss, modification and fragmentation, or mortality of fishers due to other human activities. Many States, Tribes, and Federal agencies recognize the fisher as a species that has declined substantially; however, agency use of available regulatory mechanisms or development of new regulations to conserve the species continues to be limited. There are no Federal regulatory mechanisms that specifically address the management or conservation of functional fisher habitat. The States in the DPS provide fishers with protections from hunting and trapping, and regulatory mechanisms governing forest management may incidentally provide some conservation benefits for fishers. The fisher is regulated under the Convention on International Trade in Endangered Species of Wild Fauna and Flora, a treaty established to prevent international trade that may be detrimental to the survival of wild plants and animals (IUCN).

Federal Regulations

Federal activities on National Forest lands are subject to compliance with Federal environmental laws including the Multiple-Use Sustained-Yield Act of 1960 (16 U.S.C. 528 *et seq*.), National Environmental Policy Act of 1969 (42 U.S.C. 4321 *et seq*.) (NEPA), and Clean Water Act of 1972 as amended (33 U.S.C. 1251 *et seq*. 1323 *et seq*.), as well as the National Forest Management Act of 1976 (90 Stat. 2949 *et seq*.; 16 U.S.C. 1601-1614) (NFMA).

The 2008 NFMA planning rules (73 FR 21468, April 21, 2008) were in effect for the previous Candidate Notice of Review. We do not have information to indicate that the rule shift in emphasis from previous NFMA planning rules (“viable populations of vertebrates”: to “sustaining native ecological systems”) resulted in a loss of fisher populations or habitat. As a result of a December 18, 2008, federal court decision (*Citizens for Better Forestry, et al. v. U. S. Department of Agriculture, et al., No. C08–1927 CW*), the USFS reinstated the NFMA amended planning rule of 2000, while the 2008 amendment is under review.

The USFS Sensitive Species Policy (USFS Manual 2670.32), and the BLM 6840 manual call for both National Forests and BLM districts to assist and coordinate with other Federal agencies and States to conserve species with viability concerns. The fisher has been identified as a sensitive species by the USFS Pacific Southwest (Region 5) and the Pacific Northwest Regions (Region 6) and Oregon-Washington and California BLM.

NEPA requires all Federal agencies to formally document, consider, and publicly disclose the environmental impacts of major federal actions and management decisions significantly affecting the human environment. The resulting documents are primarily disclosure documents, and NEPA does not require or guide mitigation for impacts.

Projects that are covered by certain “categorical exclusions” are exempt from NEPA biological evaluation. The USFS and the BLM have recently revised their internal implementing procedures describing categorical exclusions under NEPA 68 FR 33813 (June 5, 2003). The joint notice of NEPA implementing procedures adds two categories of actions to the agency lists of categorical exclusions:
(1) hazardous fuels reduction activities; and
(2) rehabilitation activities for lands and infrastructure impacted by fires or fire suppression.

These exclusions apply only to activities meeting certain criteria; mechanical hazardous fuels reduction projects up to 400 ha (1,000 ac) in size can be exempt and hazardous fuels reduction projects using fire can be exempt if they are less than 1,821 ha (4,500 ac). See 68 FR 33814 for other applicable criteria. Exempt post-fire rehabilitation activities may affect up to 1,700 ha (4,200 ac).

The Northwest Forest Plan (NWFP) was adopted in 1994 to guide the management of 9.7 million ha (24 million ac) of Federal lands (USDA USDI 1994b, p. 2) in portions of western Washington and Oregon, and northwestern California (USDA, USDI 1994 a, b). The NWFP represents a 100-year strategy intended to provide the basis for conservation of the northern spotted owl (*Strix occidentalis caurina* [spotted owl]) and other late-successional and old-growth forest associated species on Federal lands. Implementation of the NWFP is intended over time to provide a network of large block reserves of late successional forest habitat connected through riparian reserves surrounded by a matrix of younger more intensively managed forest. As the forests mature, the plan will lead to a substantial improvement in current habitat conditions for fishers on Federal lands within the reserve network. However, the assessment of NWFP implementation on fishers within the plan area projected a 63 percent likelihood of achieving an outcome in which habitat is of sufficient quality, distribution, and abundance to allow the fisher population to stabilize and be well distributed across Federal lands (FEMAT 1V-173). Zielinski et al. (2006, pp. 409–430) completed an analysis of the late-successional reserve network in northern California using landscape suitability models. The authors concluded that the current reserve network is not located to provide well connected habitats for fishers (Zielinski et al. 2006, p. 427).

The Sierra Nevada Forest Plan Amendment (SNFPA) was adopted in January 2001, and a Final Record of Decision (ROD) was enacted in January of 2004 (USDA 2000, 2001, 2004). The final ROD provides the framework guidance and policy document for managing 11 National Forests and about 4.5 million ha (11 million ac) of California's National Forest lands in the Sierra Nevada and Modoc Plateau. The SNFPA includes measures expected to lead to an increase over time of late-successional forest retention of important wildlife structures such as large diameter snags and coarse downed wood, and management of about 40 percent of the plan area as old forest emphasis areas. The SNFPA also established a Southern Sierra Fisher Conservation Area with additional requirements intended to maintain and expand the fisher population of the southern Sierra Nevada. Conservation measures for the fisher conservation area include maintaining at least 60 percent of each watershed in mid-to-late successional forest (28 cm [11 in] dbh and greater) with forest canopy closure of 50 percent or more. The plan also includes protections for known fisher den sites but given the difficulty of locating fisher den sites without radio telemetry this measure has very limited conservation value outside of study areas.

Each National Forest is operated under a Land and Resource Management Plan (LRMP) and each BLM district is operated under a Resource Management Plan (RMP). The NWFP standards and guidelines apply for National Forests and BLM districts within the range of the spotted owl except when the standards and guidelines of LRMPs or RMPs are more restrictive or provide greater benefits to late-successional forest species. Most National Forests and BLM districts within the range of the DPS have LRMPs or RMPs that incorporate the provisions of the NWFP or are amended by the SNFPA. Not all BLM RMPs in California are within the area covered by the NWFP, however, a majority of fisher habitat in the State is included under the NWFP. Most individual Forest LRMPs and BLM district RMPs do not provide any additional protections to fishers or fisher habitat; therefore, the above discussion regarding the NWFP and SNFPA summarizes the primary regulatory mechanisms in place on National Forest and BLM lands within the DPS area.

Land management plans for the National Parks within the DPS do not contain specific measures to protect fishers, but areas not developed specifically for recreation and camping are managed toward natural processes and species composition and are expected to maintain fisher habitat. Hunting and trapping are not allowed in the parks. Fisher habitat occurs within National Parks in the DPS, however, in the Olympic, North Cascades, and Mount Rainier National Parks in Washington, Crater Lake National Park in Oregon, and Yosemite, Sequoia, and Kings Canyon National Parks in California have areas classified as alpine and are above elevations expected to contain habitat suitable for fishers. Currently, the Olympic National Park, Olympic National Forest, and WDFW are cooperating and implementing a reintroduction effort to re-establish fishers on suitable lands within the Olympic National Park.

Some non-Federal lands are managed under Habitat Conservation Plans (HCP) with strategies that conserve habitat for a variety of species. These HCPs may provide some incidental benefit to fishers. A few HCPs cover areas within the historical range of the fisher, particularly in western Washington and northwestern California. Although the fisher is a covered species in seven HCPs within Washington and California, the species is currently known to be present only on lands under two California HCPs. In most HCPs, the areas where late-successional habitat will be protected or allowed to develop are mostly in riparian buffers and smaller blocks of remnant old forest. The HCP conservation strategies generally do not address the moderate to closed canopy forest conditions and the retention and recruitment of late seral structure that appear to be important for sustaining resident fisher populations, particularly for providing den and rest sites.

Tribal Lands

In California, the Hoopa Valley Indian Reservation forest management plan (Tribal Forestry 1994) addresses the 360 km^2 (88,958 ac) Reservation where fishers are known to be present, and contains about 303.5 km^2 (75,000 ac) of commercial timberland. The forest management plan also recognizes fisher as a traditional and culturally important species and designates fishers as a species of special concern. The Hoopa Valley Tribal Forestry department is committed to ecological research and monitoring of fishers on the Reservation and continues to be one of the leaders conducting ecological studies of fisher in the State of California. Their forest management plan contains some protective measures such as setting aside three to seven habitat reserves (each 29 ha [50 ac] or less in size) to provide benefits for pileated woodpeckers (*Dryocopus pileatus*), mink, and other species such as fishers. Intensive timber harvest will not occur within the reserves. The plan also establishes 32 no-harvest reserves (minimum of 24 ha [60 ac] each) for late-seral, cultural, sensitive, and federally listed species.

Other tribal lands within the DPS manage their forests under a variety of management plans. Some of these forest management plans (Warm Springs Reservation of the Confederated Tribes, The Coquille Tribe of Oregon, and The Confederated Tribes and Bands of the Yakama Nation) contain guidelines and habitat protection measures for spotted owls, riparian areas, snags, and logs that will, at a minimum, provide some of the habitat components important to fishers and their prey.

State Regulations

Washington

In October 1998, the State of Washington listed the fisher as Endangered (WAC 232-12-297), which provides additional protections in the form of more stringent fines for poaching and a process for environmental analysis of projects that may affect the species. There are no special regulations to protect habitat for fishers or to conduct surveys for this species prior to obtaining forest activity permits.

The Washington Department of Natural Resources (WDNR) manages the State lands in Washington. State lands occupy a substantial portion of the fisher's historical range in the State, consisting of roughly 647,500 ha (1.6 million ac) of forest within the range of the spotted owl (primarily lands west of the crest of the Cascade Range). Because these lands generally occur at lower elevations than National Forest lands, a higher proportion is within the elevation range preferred by fishers (Aubry and Houston 1992, pp. 74–75; WDNR 1997, p. 12). Thus, State lands could provide an important contribution to the conservation of fishers. Over half of all WDNR forests, however, are less than 60 years in age and less than 607 km^2 (150,000 ac, about 9 percent) are over 150 years, indicating that most old growth on Washington State lands has been liquidated (WDNR 1997, p. 13).

Several State Parks in Washington contain remnant stands of mature and late- successional forest and may have suitable habitat for fishers. Like elsewhere, these parks are widely scattered and isolated by large areas of industrial forest land or urban and rural development that is unsuitable for fishers. Unfortunately, many of the larger parks are on islands and would not contribute to the recovery of the fisher. A few state parks and forests, such as Mount Pilchuck State Forest, and Rockport, Ollalie, Hamilton Mountain, Beacon Rock, Twin Falls, and Wallace Falls State Parks have limited habitat which may provide some foraging opportunities for dispersing fishers and extend the habitat on Federal lands in the Cascades.

About 28,330 km^2 (7 million ac) of non-Federal forest lands exist within the historical range of the fisher in the Olympic Peninsula and Cascades in Washington and about 2 percent (approximately 616 km^2 [152,300 ac]) was typed as suitable habitat for fishers (Lewis and Hayes 2004, p. 34). The primary regulatory mechanism on non-Federal forest lands in western Washington is the Washington State Forest Practice Rules, Title 222 of the Washington Administrative Code. These rules apply to all commercial timber growing, harvesting, or processing activities on non-Federal lands, and they give direction on how to implement the Forest Practice Act (Title 76.09 Revised Code of Washington) and Stewardship of Non-Industrial Forests and Woodlands (Title 76.13 RCW). The rules are administered by the WDNR, and related habitat assessments and surveys are coordinated with the WDFW.

Washington's forest practice rules limit regeneration harvest areas to 49 ha (120 ac) in size with exceptions given up to 97 ha (240 ac). In all cutting units, three wildlife reserve trees (over 30 cm [12 in]) diameter), two green recruitment trees (over 25 cm [10 in] diameter, 9 m [30 ft)] in height, and 1/3 of height in live crown) and two logs (small end diameter over 30 cm [12 in], over 6 m [20 ft] in length) must be retained per acre of harvest. These trees may be counted from those left in the “riparian management zones,” which range in size from 25 to 62 m (80 to 200 ft) for fish-bearing streams, depending on the size of the stream, the class of site characteristics, and whether the harvest activity is east or west of the Cascade crest (Washington Administrative Code 222-30). Riparian management zones for non fish-bearing streams are 15 m (50 ft), applied to specified areas along the streams. Riparian buffers may provide some habitat for fishers, primarily along perennial fish-bearing streams where the riparian buffer requirements are widest. Twenty-eight hectares (70 ac) of habitat must be protected around all known spotted owl activity centers. The Washington State Forest Practice Rules do not specifically address fishers and their habitat requirements, however, some habitat components important to fishers, like snags, down wood, and canopy cover in riparian areas are likely to be retained as a result of the rules.

Oregon

In Oregon, the fisher is designated a protected non-game species, and is listed as a “Sensitive Species-Critical Category.” The Oregon Department of Fish and Wildlife (ODFW) does not allow take of fishers in Oregon, but some fishers may be injured and killed by traps set for other species. Training and testing is required of applicants for trapping licenses in order to minimize the potential take of non-target species such as fishers.

In Oregon, two final forest management plans for state forests in northwest and southwest Oregon were approved by the Oregon Board of Forestry in January 2001, the Northwest Oregon State Forests Plan and the Southwest Oregon State Forests Plan. The Elliott State Forest Management Plan was approved in 1994 and the Elliott State Forest Habitat Conservation Plan for spotted owls and marbled murrelets (*Brachyramphus marmoratus*) was approved in 1995. The management plan has since been revised and was completed in 2005.

The management plans for Oregon's State Forests generally appear to be of little benefit to fishers. The 73 km^2 (18,074 ac) of State forest lands in the Southwest Oregon State Forests Plan (2001, p. 1) area consists of generally small parcels that range in size from 0.16 km^2 to 14 km^2 (40 ac to 3,500 ac) and are widely scattered. There are no specific measures for or mention of fishers in the plan. The Northwest Oregon State Forests Management Plan (2001, p. 1) provides management direction for 2,491 km^2 (615,537 ac) of state forest land, located in 12 northwest Oregon counties, but has no specific provisions for fishers. Both plans include provisions to protect some forest reserves, but these are not likely to benefit fishers because of the fragmented nature of the lands.

The Oregon Department of Forestry (ODF) implements the Forest Practice Administrative Rules and Forest Practices Act (ODF 2000). Interim procedures (section 629-605-01 80, Oregon Forest Practice Rules) exist for protecting sensitive resource sites on all State, county, and private lands in Oregon. These procedures apply only to threatened and endangered species, and to bird species listed as “sensitive” in the rules, and currently do not apply to fishers. Prior approval from the State Forester is also required before operating near or within critical wildlife habitat sites (629-605-0190), including habitat of species classified by ODFW as threatened or endangered, or any federally listed species, but fishers do not currently benefit from this status. Twenty-eight hectares (70 ac) of habitat must be protected around all known spotted owl activity centers.

Although Oregon's rules governing forest management on State, county, and private lands do not directly protect the fisher or its habitat, the rules may provide some protection for fisher habitat elements. In regeneration harvest units that exceed 10 ha (25 ac), operations must retain two snags or two green trees, and two downed logs per acre. Green trees must be over 28 cm (11 in) dbh and 9 m (30 ft) in height, and down logs must be over 1. 8 m (6 ft) long and 0.28 cubic meters (10 cubic feet) in volume. Riparian management areas (RMAs) provide for vegetation retention in a band of 6 to 30 m (20 to 100 ft) in width, depending on stream size and type. In general, RMAs for fish-bearing and domestic-use streams require no tree harvesting within 6 m (20 ft) of the stream, and, within the entire RMA, retention of a minimum basal area of conifer trees (40 trees per 305 m [1,000 ft] of stream for thinning operations). Similar guidelines retain vegetation around wetlands, lakes, seeps, and springs. No RMA is required for streams that do not provide for domestic water use or bear fish, for small wetlands, or for lakes 0.2 ha (0.5 ac) or less.

California

The State of California manages relatively little forested lands. California has eight Demonstration State Forests totaling 287 km^2 (71,000 ac), of which less than 81 km^2 (20,000 ac) are within the current range of the fisher. These forests are managed primarily to achieve maximum sustained production of forest products, not for late-successional characteristics. California has about 270 State Park units totaling approximately 5,260 km^2 (1.3 million ac), which are mostly outside the historical range of the fisher and appear to provide little habitat for fishers. The largest state park in the fisher's historical range, Humboldt Redwoods State Park, includes about 214 km^2 (53,000 ac) in southern Humboldt with a stated goal of protecting California species of concern.

The State of California classifies the fisher as a furbearing mammal that is protected from commercial harvest, which provides protection to fishers in the form of minor fines for illegal trapping; trapping is discussed further under Factor B. On April 8, 2009, the California Fish and Game Commission accepted a petition initiating a 12-month review of the status of fisher by the CDFG, pursuant to Fish and Game Code Section 2074.6. At its June 23, 2010, meeting, the California Fish and Game commission determined that listing was not warranted as suggested by CDFG in the “Report to the Fish and Game Commission, A Status Review of the Fisher (*Martes pennanti*) in California” (2010, p. 88). This determination is currently being challenged by the Center for Biological Diversity (*CBD v California Fish and Game Commission et al*., Case No. CGC-10-505205, San Francisco Superior Court of California). CBD asserts that the Commission and Department violated the California Endangered Species Act by: (a) wrongly concluding that fishers are not threatened or endangered throughout a significant portion of their range, (b) relying on a flawed Status Review, (c) not complying with CESA’s peer review requirements, and (d) failing to rely on the best available science. The case is currently scheduled to be heard in the Superior Court of San Francisco on April 24, 2012.

The California Wildlife Action Plan (CDFG 2007, entire) does not identify any goals or objectives for conservation specifically for fishers in the state. The 2010 Status Review (CDFG 2010, pp. 81–84) lists 23 specific recommendations for future management and recovery of fishers in the state.

The California Environmental Quality Act (CEQA) requires disclosure of potential environmental impacts of public or private projects carried out or authorized by all non-Federal agencies in California. CEQA guidelines require a finding of significance if the project has the potential to “reduce the number or restrict the range of an endangered, rare or threatened species” (CEQA Guidelines 15065). The lead agency can either require mitigation for unavoidable significant effects, or decide that overriding considerations make mitigation infeasible (CEQA 21 002), although such overrides are rare. CEQA can provide protections for a species that, although not listed as threatened or endangered, meets one of several criteria for rarity (CEQA

15380). The emergency regulation concerning incidental take of fisher also provides consistency with the CEQA (Division 13 (commencing with Section 21000) of the Public Resources Code), stating, “if a State or local agency determines that an activity identified in subdivision (a) will result in a significant impact on fisher, the agency should not approve the activity as proposed if there are feasible alternatives or feasible mitigation measures available which would substantially lessen the significant impact on Pacific fisher.”

Regulatory protections for critical habitat and habitat requirements for federally-listed species required under CEQA (spotted owl, marbled murrelet, and anadromous salmonids) provide some elements that benefit fishers, but because these protections are not implemented consistent with specific life history requirements of fishers, these measures may be of limited conservation value for fishers. Additionally, a large part of the contemporary and historical west coast range of the fisher in California is outside the range of the listed spotted owl, marbled murrelet, and salmonid species.

In California, logging activities on commercial (private and State) forest lands are regulated through a process that is separate from, but parallel to, CEQA. Under CEQA provisions, the State has established an independent regulatory program to oversee timber management activities on commercial forest lands, under the Z'berg-Nejedly Forest Practice Act of 1973 and the California Forest Practice Rules (FPRs) (CAL FIRE 2010). The California FPRs are administered by the California Department of Forestry and Fire Protection (CAL FIRE), and apply to commercial harvesting operation for non-Federal, non-Tribal landowners of all sizes.

The California FPRs provide specific, enforceable protections for species listed as threatened or endangered under CESA or the Act, and for species identified by the California Board of Forestry as “sensitive species” (CAL FIRE 2010); however, the fisher is not currently on any of these lists. The FPRs also include intent language about reducing significant impacts to non-listed species (FPR §919.4, 939.4, 959.4) and maintaining functional wildlife habitat (FPR §897(b)(1)). This language, however, has not been effective in securing protections for species, due to the lack of specific enforceable measures in the rules. Moreover, FPR language (§1037.5(f)) makes it difficult for CAL FIRE to adopt mitigation measures above those specified in the California FPRs, unless agreed to by the landowner. In comments to CAL FIRE on timber harvest plans in northwestern California, CDFG has raised concerns regarding adverse effects on fishers and other species associated with the loss of late-seral habitat elements, and has recommended retention of such elements. CDFG (2010, p. 71), in their report to the commission, concluded that without additional regulations, policy, or guidance, Addendum No. 2 of the FPRs does not currently provide adequate protection for fisher habitat.

While the California FPRs generally require that all snags within a logged area be retained to provide wildlife habitat, they also allow broad discretionary exceptions to this requirement for safety concerns, which greatly reduces the effectiveness of the snag retention requirement. The FPRs do not require the retention of downed woody material, making retention of these structural elements voluntary. Similarly, the California FPRs do not contain effective and or enforceable measures for protection of decadent or other large trees with structural features such as platforms, cavities, and basal hollows, which appear to be important components of fisher habitat. Some timber operations, such as salvage, fuel wood harvest, power line right-of-way clearing, and fire hazard reduction are exempt from timber harvest plan preparation and submission requirements.

California's FPRs provide for disclosure of impacts to late successional forest stands, in some cases. The rules require that information about late successional stands be included in a timber harvest plan when late successional stands over 8 ha (20 ac) in size are proposed for harvesting and such harvest will “significantly reduce the amount and distribution of late succession forest stands” (FPR §919.16, 939.16, 959.16). If the harvest is found to be “significant,” FPR S919.16 requires mitigation of impacts where it is feasible. In practice, such a finding during plan review is very rare and likely to be challenged by the landowner. Also, few proposed harvests trigger the late-successional analysis because very little forest on commercial timberlands meets the definition of late-successional forest, due to past logging history (CDFG 2010, p. 68).

The California FPRs require retention of trees within riparian buffers to maintain a minimum canopy cover, dependent on stream classification and slope. The FPR prescriptions are not designed or intended to protect late-seral habitat components, but this may occur at times. The rules currently mandate retention of large trees in watersheds identified as having “threatened or impaired” values (watersheds with listed anadromous fish). For Class I (fish-bearing) streams, the 10 largest conifer trees per 133 m (330 ft) of stream channel must be retained along qualifying watercourses. These trees are retained within the first 15 m (50 ft) of permanent woody vegetation measured out from the stream channel. There are no additional protection measures required for non-fish-bearing streams (classes II and III) within “threatened or impaired” watersheds.

The threatened and impaired provision applies to many streams within the fishers’ range in northern California, but anadromous fish no longer occur in most of the Sierra Nevada or upper Trinity River basin (where fishers still occur). Where applied, the threatened and impaired rules should result in the retention of some large trees of value to fishers, although the protective value is limited, as it applies to only a small part of any affected watershed (CDFG 2010, pp. 66–67). Averaged over the landscape, the measure provides less than one retained tree per forested acre in qualifying watersheds, based on an evaluation of a sample of northwestern California timber harvest plans (Osborn 2003). Also, in many watersheds, few large trees remain along watercourses, thus most of the trees retained under this measure are likely to be of a size and age that provide little current value as late-seral elements commonly used by fishers. Over time, the retained trees may develop late-seral and decadent characteristics, but this is likely to take place over time scales of decades.

Outside of “threatened and impaired“ watersheds, watercourse protection measures are limited. Class I streams must retain at least 50 percent of the overstory and 50 percent of the understory. No minimum canopy closure requirements are specified for Class II and Class III streams. Harvest plans are required to leave 50 percent of the existing total canopy including the understory, but provide no protection for large trees or other late-sera1 habitat elements outside of “threatened and impaired” watersheds .

In summary, the primary threats from inadequate regulatory mechanisms are the continuing loss and fragmentation of suitable habitat and loss of important habitat structural elements. Any of the key elements of fisher habitat (see Habitat section and Factor A analysis) may be affected by Federal and State management activities. Activities under Federal regulatory control that result in fisher habitat loss, fragmentation, removal, or preclude recruitment of key structural elements promote further isolation of fisher populations pose a risk to the persistence of fishers. A large proportion of federally managed forests within the range of the West Coast DPS for the fisher are managed under the NWFP or SNFPA. These regional planning efforts provide for retention and recruitment of older forests, and provide for spatial distribution of this type of habitat that will benefit late-successional forest dependent species such as the fisher. The adequacy of these plans, however, is uncertain. Even with these plans in place, timber harvest, fuels reduction treatments, and road construction may continue to result in the loss of habitat and habitat connectivity in areas, resulting in a negative impact on fisher distribution, abundance, and recovery or recolonization of currently unoccupied habitat within their historical range.

Existing habitat conservation plans for non-Federal timberlands provide some additional benefits to fishers. These plans are focused on providing protection for the habitat of spotted owls, marbled murrelets, and listed salmonids, which can protect important habitat elements for fishers where habitat overlaps. HCPs only apply to a small part of the fishers’ currently occupied range on non-Federal lands in Oregon and California and the adequacy of the measures in these plans is uncertain.

The same potential risks apply to non-Federal forested lands as discussed for lands under Federal regulatory control. Protections for fisher habitat and key structural elements that are provided under State regulation of forest practices are substantially less than provided on Federal lands. In addition, within the DPS, private timber lands occur primarily at the more productive lower elevations which historically provided for fishers to a greater extent than areas of higher elevation Federal forests. Existing regulatory processes for non-Federal, non-Tribal timberlands in Washington, Oregon, and California do not include specific measures for management and conservation of fishers or fisher habitat. While the State regulatory process for these lands in all three States incidentally protects some fisher habitat via the forest practice rules, the benefits are limited and do not include strategies which target either fishers or key fisher habitat requirements.

E. Other natural or manmade factors affecting its continued existence:

Other anthropogenic factors that contribute to individual fisher mortality and fitness include contaminants, pest control programs, non-target poisoning, collision with vehicles, and accidental trapping in manmade structures (Folliard 1997, p. 7; Truex et al. 1998, p. 34, Gabriel et al. 2011, Sweitzer et al. 2011). It is likely that where fisher distribution overlaps with current and future human developments, these causes of mortality will continue to occur and potentially increase with increases expected in rural development (Naney et al. 2012, pp. 21–23, 25–26).

An emerging conservation concern is how the use of anticoagulant rodenticides may be affecting fishers. Prevalence of exposure to anticoagulant rodenticides in fishers from California and Washington is quite high with 80% of 71 fishers sampled testing positive for exposure to anticoagulant rodenticides (Gabriel 2012). It is unknown at this time whether exposure to these toxicants has an additive sublethal or chronic effect on an individual fisher or population; however, four fisher mortalities from California were directly attributed to anticoagulant rodenticides toxicosis (Gabriel 2012). To date, no direct consumption of anticoagulant rodenticides has been detected in fisher stomach contents' thus suggesting that exposure to these toxicants may be from secondary poisoning from consumption of prey or carrion that had been exposed to anticoagulant rodenticides (Gabriel 2012).

Low reproductive rates retard the recovery of populations from declines, further increasing their vulnerability (Lehmkuhl and Ruggiero 1991, pp. 37–38). The annual reproductive rate, estimated here using the annual average denning rate for female fishers in western North America is 0.64 (range = 0.39–0.89) (Lofroth et al. 2010, pp. 55–57). Truex et al. (1998, p. 35) documented that of the females in the southern Sierra Nevada study area (one of three study areas that they analyzed in California), about 50 to 60 percent successfully gave birth to young. In the Hoopa study area in northern California, annual reproductive rates averaged greater than 70 percent (Higley and Matthews 2006, p. 9). Annual fisher reproductive rates varied widely in the study areas analyzed by Truex et al. (1998, p. 35) on the north coast, Sierra Pacific Industries and CDFG in Trinity County, California (Reno et al. 2008, p. 14), Weir and Corbould (2008, p. 27) in British Columbia, and Aubry and Raley (2006, p. 11) in southern Oregon. These data suggest that fisher reproductive rates vary widely both annually and between populations.

Female survival has been shown to be the most important single demographic parameter determining fisher population stability (Truex et al. 1998, p. 52; Lamberson et al. 2000, pp. 6, 9). Higley and Matthews (2009, p. 62) documented an annual female survival rate of 77.5 percent (range 58.9 percent–94.4 percent) from 2005–2009 for females marked in their study. Truex et al. (1998, p. 32) documented an annual survival rate, pooled across years from 1994 to 1996, of 61.2 percent of adult female fishers in the southern Sierra Nevada, 72.9 percent for females in their eastern Klamath study area, and 83.8 percent for both females and males in their North Coast study area. Addressing the southern Sierra Nevada population, Truex et al. (1998, p. 52) conclude that, “High annual mortality rates raise concerns about the long-term viability of this population.” From spring 2007 to winter 2011, Sweitzer et al. (2011) report adult female survival for two study areas in the southern Sierra Nevada population as 72 percent (confidence interval of 56 percent–88 percent) in the north and 74 percent (confidence interval of 60 percent–87 percent) in the south. Lamberson et al. (2000, pp. 10, 16) used a model (deterministic, Leslie stage-based matrix) to gauge risk of extinction for the southern Sierra Nevada population of fisher and found that the population has a very high likelihood of extinction given reasonable assumptions with respect to demographic parameters. Spencer et al. (2011, p. 797) concluded that a 10–20 percent reduction in survivorship interfered with population expansion in their modeling exercise for the southern Sierra Nevada population.

Demographic stochasticity, the chance events associated with annual survival and reproduction, and environmental stochasticity, the temporal fluctuations in environmental conditions, genetic uncertainty, and catastrophic events, both tend to reduce population persistence (Shaffer 1981, p. 131, 1987, pp. 71–81; Boyce 1992, pp. 482–491). Habitat specificity coupled with habitat fragmentation may also contribute to the exceptionally low levels of gene flow (migrants per generation) estimated among populations of fisher (Wisely et al. 2004, p. 644). Wisely et al. (2004, p. 644) found that populations of fisher exhibit high genetic structure (FST = 0.45, SE = 0.07) and limited gene flow (Nm less than 1) within their 1,600 km (994 mi) long peninsular distribution down through Washington, Oregon, and California. They state concerns about the future viability of the western fisher: "...we found that genetic diversity decreases from the base [British Columbia] to the tip [southern Sierra Nevada] of the peninsula, and that populations do not show an equilibrium pattern of isolation-by-distance. The reduced dimensionality of the distribution of fishers in the West appears to have contributed to the high levels of structure and decreasing diversity from north to south. The low genetic diversity and high genetic structure of populations in the southern Sierra Nevada suggest that populations in this part of the geographic range are vulnerable to extinction."

The apparent loss of fishers from most of Washington and Oregon, and the northern contraction in the British Columbia populations, has resulted in fishers in California being isolated from fishers elsewhere in North America. This isolation precludes both immigration and associated genetic interchange, increasing the vulnerability of the Northern California-Southwestern Oregon populations to the adverse effects of deterministic and stochastic factors. Wisely et al. (2004, p. 644) documented that fishers in northern California already have lower genetic diversity than other populations in North America. Drew et al. (2003, p. 57) cite evidence of genetic divergence between the California and British Columbia fisher populations since becoming isolated. Likewise, the northern and southern California fisher populations exhibit high genetic divergence (Wisely et al. 2004, p. 644, Knaus et al. 2011, p. 11). The genetic divergence of California populations from each other and from British Columbia fishers could be associated with adaptation to local conditions, but is more likely the result of reduction of population numbers with habitat loss (Drew et al. 2003, p. 59).

Genetic studies using entire mitogenome DNA sequencing indicate that California populations, in particular, differ genetically from each other and from all other populations (Knaus et al. 2011, p. 12). These results are consistent with the conclusions of Aubry and Lewis (2003, pp. 87–88) that native populations in California and the reintroduced population in southwestern Oregon have become isolated from the main body of the species' range due to the apparent extirpation of fishers in Washington and northern Oregon. According to Drew et al. (2003, pp. 56–58), their findings suggest that gene flow once occurred between fisher populations in British Columbia and those in the Pacific states, but extant populations in these regions are now genetically isolated. Kanus et al. (2011, p. 11) hypothesized that the southern Sierra Nevada population may have been isolated prior to European settlement. Regardless of the time since separation, the southern Sierra Nevada population is geographically isolated from the established Northern California-Southwestern Oregon population by approximately 420 km (260 mi) (Zielinski et al. 1995, pp. 107–111; 1997b, p. 386; 2005, pp. 1394–1395) and approximately under 300 km from fishers resulting from the 2009 reintroduction into the northern Sierra Nevada. There is low probability of migration of individuals from other populations since the distance to the nearest known fishers is almost three times the species' maximum recorded juvenile dispersal distance of 107 km (66 mi) (mean 33 km [20.5 mi]) as reported by York (1996, pp. 45, 56). The unexpected magnitude of the Pacific States's fisher genetic structure and lack of gene flow indicates that intermediate distances may represent evolutionarily important barriers to movement that can facilitate rapid genetic divergence (Wisely et al. 2003, p. 646).

It is difficult for subpopulations to rescue each other when distributed in such a narrow, linear,north-south peninsular distribution. Even isolated from other threats, the north-south peninsular distribution of fishers in the Sierra Nevada is a risk factor for the southern Sierra Nevada population. Being at the southernmost extent of the genus' distribution, the population already exists at the edge of environmental tolerances. The loss of remaining genetic diversity may lead to inbreeding and inbreeding depression. Given the recent evidence for elevated extinction rates of inbred populations, inbreeding may be a greater general threat to population persistence than is generally recognized (Vucetich and Waite 1999, p. 860).

According to Heinemeyer and Jones (1994, pp. 19, 29) and more recent threat assessments completed in California and for the West Coast population of fishers (Green et al. 2008, pp. 26–27, 45; CDFG 2010, pp. 45–47, 53; Naney et al. 2012, p. 29) the greatest long-term risk to fishers in the DPS is isolation of small populations and the higher risk of extinction due to stochastic events (Stacey and Taper 1992, pp. 25–27). Fishers are known to be solitary and territorial with large home ranges which results in low population densities as the population requires a large area with available suitable habitat for survival and proliferation. Given the apparent reluctance of fishers to cross open areas (Coulter 1966, pp. 59–61; Kelly 1977, pp. 74–78, 81; Powell 1993, p. 91; Buck et al. 1994, pp. 373–375; Jones and Garton 1994, p. 385, Weir and Corbould 2010, pp. 407–408), it is more difficult for fishers to locate and occupy distant, but suitable, habitat. Even in the absence of dispersal barriers, modest increases in mortality rates (approximately 10–20 percent) from the additive effects of multiple causes (for example road kill, disease) may interfere with population expansion (Spencer et al. 2011, p. 796).

Preliminary analyses indicate west coast fisher populations, particularly in the southern Sierra Nevada and southern Cascades in Oregon may be at significant risk of extinction because of small population size and factors consequent to small population size such as isolation, low reproductive capacity, and demographic and environmental stochasticity. Furthermore, the potential effects of stochastic events on small populations combined with difficult to quantify interactions and synergy among threats (Naney et al. 2012, p. 36) will likely exacerbate the risk of extinction.

A scarcity of verifiable sightings in Washington, northern and central Oregon, and the northern and central Sierra Nevada of California suggests that the fisher is extirpated from most of its historical range in Washington, Oregon, and California (Zielinski et al. 1997b, p. 373; Aubry and Raley 2002, pp. 8–9; Zielinski et al. 2000, p. 17: Zielinski et al. 2005, p. 1395). The southern Sierra Nevada population and Northern California-Southwestern Oregon population are the only naturally-occurring, known breeding populations of fisher in the DPS south of central British Columbia (Zielinski et al. 1997b, p. 1401).

These factors together imply that fishers are highly prone to localized extirpation, their colonizing ability is somewhat limited, and their populations are slow to recover from deleterious impacts. The long-term persistence of these isolated populations is unknown.

Conservation Measures Planned or Implemented :

In FY 2010, Region 8 of the USFWS developed a 5-year action plan for the West Coast Distinct Population Segment of the fisher. The action plan provides a brief outline of goals and actions designed to maintain or improve the species' current listing status over the next 5 years. Given the current status of the population and potential population growth rate of fisher, a 5 year time frame, however, is likely insufficient to demonstrate satisfactory increases in population numbers or geographic extent to remove the species from the candidate list. Large amounts of time and money from multiple federal and state agencies will be needed to demonstrate existing populations are enlarging, new populations are established, or both. This would most likely be accomplished through an integrated population trend monitoring and reintroduction program. Within the next 5 years, we can initiate the programs needed to demonstrate expansion and establish new populations within the historical range of the fisher in the West Coast DPS. The action plan contains four action categories and 17 tasks; below we provide the four action categories with brief justification statements. The complete action plan can be found on-line at: [*http://ecos.fws.gov/docs/action_plans/doc2999.pdf*].

Action A. Develop conservation strategies among Federal, State, and local agencies as well as private land owners. Brief Justification: Needed to achieve conditions that are predicted to maintain and increase the

geographic extent of existing populations.
Action B. Develop a systematic survey and monitoring program for fishers throughout their historical range in the Pacific states and ensure that it has long-term institutional support. Brief Justification: A reliable understanding of the distributional boundaries of extant populations is of significant importance to fisher conservation. Only coordinated, large-scale systematic surveys can provide the means to monitor changes in the distribution and relative abundance of fishers over time.
Action C. Conduct research to assist in recovery and conservation planning. Brief Justification: Key knowledge gaps in fisher ecology exist.
Action D. Augment existing populations or reintroduce extirpated populations in suitable habitat within the historical range of fisher. Brief Justification: Addresses threat of isolation of small populations. Additional fisher populations will reduce the probability of extirpation of species within its West Coast range. Action D would benefit from completion of Action A.

In FY 2010, 2011, and 2012 the Federal agencies (USFS (Regions 5 and 6), BLM (Oregon-Washington, California), NPS, USFWS), tribes, State wildlife agencies from Washington, Oregon, and California, and British Columbia Ministry of Environment completed a Conservation and Threat Assessment (Lofroth et al. 2010, entire; Lofroth et al. 2011, entire; Naney et al. 2012, entire). Volumes I and III provide "Implications for Conservation" that provide foundational concepts for developing conservation strategies. Where appropriate, information from these three assessments have been incorporated into this species assessment and cited accordingly.

In FY 2008, the Pacific Region (Region 5) of the USFS completed a conservation assessment for the fisher in the Sierra Nevada Mountains. This effort is part of the Sierra Nevada Framework planning document and is a collaborative effort including scientists from the State and Federal agencies. The assessment provides "Conservation Options" to assist development of a conservation strategy for the southern Sierra Nevada fisher population in California.

The WDFW, in cooperation with the Olympic National Park, US Geological Survey, and others, began to reintroduce fishers onto Park Service lands on the Olympic Peninsula in Washington January 2008 (Lewis and Happe 2008, p. 7). These fishers will be monitored for a number of years to determine both the extent of their distribution and success in establishing a reproducing population of fishers on the Olympic Peninsula. Successful establishment of this population will not be known for several years.

The CDFG, in cooperation with the USFWS and Sierra Pacific Industries, began a translocation of fishers to the northern Sierra Nevada December 2009 (CDFG 2010, p. 79). These fishers will be monitored for a number of years to determine both the extent of their distribution and success in establishing a reproducing population of fishers in the northern Sierra Nevada. Successful establishment of this population will not be known for several years.

A Candidate Conservation Agreement (CCAA) with Assurances exists with Sierra Pacific Industries (SPI and USFWS 2008, entire). The ongoing CCAA includes a 20-year conservation measure to maintain or grow forest stands for fisher denning and resting habitat, and to implement other company practices and policies designed to promote the conservation of fishers within a 64,736 ha (159,966 acre) area in the northern Sierra Nevada California.

For the period from 2005–2011, the interagency special status species program for USFS Region 6 and Oregon-Washington BLM has funded and prioritized fisher survey efforts in Oregon to update our current understanding of extant populations to assist with strategy development.

During 2002, the USFS initiated a regional fisher monitoring program to track population trends throughout the southern Sierra Nevada. The primary objective of the program is to use sampling to detect a 20 percent decline in relative abundance of the population with 80 percent statistical power. Preliminary analysis suggests no decline in the index of abundance across the population during the monitoring period, though occupancy rates appear to vary among geographic regions within the population.

Summary of Threats :

The present or threatened destruction, modification, or curtailment of its habitat or range.
Forest cover in the DPS is projected to continue to decrease due to urban development through 2050, with timberland area projected to be about 6 percent smaller in 2050 than in 1997. Changes in habitat structure and composition, loss of both density and spatial arrangement of important habitat elements, and modifications to ecosystem processes continue to occur as a result of forest management practices and stand replacing wildfire. Given these expected changes, habitat loss, modification, and fragmentation appear to be significant threats to maintaining fisher populations in Washington, Oregon, and California in the future. In addition, substantial loss of habitat suitable for supporting fishers at the landscape scale can act cumulatively and synergistically with other identified threats with greater effect on small, isolated populations.

Overutilization for commercial, recreational, scientific, or educational purposes
Available information suggests that historical trapping was one of the primary causes of the severe fisher population declines in North America. Trapping closures, reduction in the purchase of trapping licenses in the DPS, and restrictions on use of body gripping traps in Washington and California has reduced the incidence of fisher mortalities from trapping. Although the deleterious population effects of legal trapping have been minimized, the synergistic and cumulative effects of this threat are unknown given the generally small and isolated populations currently existing in the DPS.

Disease or predation
Without further research it is uncertain if mortality from disease and predation is a significant threat to the fishers in the West Coast DPS. However, the cumulative effects of both these causes of mortality may have greater effects when they occur in small and isolated populations. If disease affects fishers in patterns similar to other mustelids, then there is the potential for disease outbreaks to reduce the size and extent of current fisher populations.

The inadequacy of existing regulatory mechanisms
Existing regulatory mechanisms that provide some protection for fishers and fisher habitat include:
(1) Federal laws, regulations, and management plans, and;
(2) State laws and regulations (particularly those that provide fishers with protections from hunting and trapping).
State laws and regulations that provide fishers with protection from hunting and trapping appear to be making mortalities and injuries from legal incidental capture of fishers in body gripping or leg-hold traps infrequent. The certainty of regulatory mechanisms preventing continued habitat loss, fragmentation and modification, or mortality due to other human activities is unknown. There are no regulatory mechanisms that specifically address the management or conservation of functional fisher habitat. Intensive forest and fuels management do not typically require the retention of the natural ecosystem processes that maintain and recruit key habitat and structural components for fishers. Therefore, implementing current regulations make it unlikely that early and mid-successional forests will provide the same prey resources, protection from predators, and rest and den sites as more mature forests.

Other natural or manmade factors affecting its continued existence
Fisher populations in the West Coast DPS are small and isolated and may be threatened by numerous factors including inbreeding depression and unpredictable variation (stochasticity) in demographic or environmental characteristics. Combinations of the five factors can interact to produce significant cumulative risk. The three current extant populations are isolated from one another and although the intensity of historical risk factors (overtrapping, predator control programs) has been diminished, these populations do not appear to have

expanded. Wisely et al. (2004, p. 646) states that fishers “have demonstrated isolation among populations with limited exchange, suggesting that populations on the Pacific coast have little demographic buffer from variation in the population growth rate.”

We find that the fisher West Coast DPS is warranted for listing throughout its range, and therefore, find that it is unnecessary to analyze whether it is threatened or endangered in a significant portion of its range.

For species that are being removed from candidate status:

_____ Is the removal based in whole or in part on one or more individual conservation efforts that you determined met the standards in the Policy for Evaluation of Conservation Efforts When Making Listing Decisions(PECE)?

Recommended Conservation Measures :

See Action items in the 5-year action plan for the West Coast Distinct Population Segment listed above in the *Conservation Measures Planned or Implemented* section.

Priority Table

Magnitude	Immediacy	Taxonomy	Priority
High	Imminent	Monotypic genus	1
		Species	2
		Subspecies/Population	3
	Non-imminent	Monotypic genus	4
		Species	5
		Subspecies/Population	**6**
Moderate to Low	Imminent	Monotype genus	7
		Species	8
		Subspecies/Population	9
	Non-Imminent	Monotype genus	10
		Species	11
		Subspecies/Population	12

Rationale for Change in Listing Priority Number:

Magnitude:

In making the finding, we recognize that there have been declines in the distribution and abundance of fishers in its West Coast range, primarily attributed to historical overtrapping, predator control programs, and habitat alteration. As a result, the fishers’ distribution within its historical range has been significantly reduced. A substantial amount of the fishers’ historical low- to mid- elevation habitat in Washington, Oregon, and the Sierra Nevada foothills has been lost or altered. There is substantial information indicating that the habitat of fishers continues to be threatened with further loss and fragmentation which could result in a negative impact on existing fisher distribution and abundance. Removing important habitat elements such as forest cover and large trees with cavities could allow predation to become a significant threat, thereby minimizing recruitment of fishers into the population. New information related to the additive effects of mortality from vehicle collisions, disease, toxicants, and predation needs to be considered for their potential to limit recovery and expansion of existing populations.

Federal, State, and private land management activities can affect key elements of fisher habitat; reduction of these key habitat elements pose a risk to fishers. Current regulations provide insufficient certainty that they will be effective, as implemented, or that they will be effective in reducing the level of threat to fishers or fisher habitat. We, therefore, find that existing regulatory mechanisms are not sufficient to protect the DPS as a whole from pressures to the populations associated with changes in habitat.

Imminence :

Although numbers of fishers are difficult to determine and we lack trend information, ongoing efforts indicate that the individual populations are persisting. The Southern Oregon Cascades population is the result of reintroduction efforts that occurred over several years (1961 to 1981) from fishers transplanted from British Columbia and Michigan. No augmentation of this population has occurred since 1981, and fishers continue to be detected in the vicinity during survey efforts and other ecological studies. The geographically larger Northern California-Southwestern Oregon population is presumably the most stable of the three. The fisher population in the southern Sierra Nevada is a relatively small population, but continues to be detected during monitoring efforts and other ecological studies. Preliminary analyses of the southern Sierra Nevada population suggest no decline in the index of abundance (2002–2009).

Conclusion: We conclude that the overall magnitude of threats to the West Coast DPS of the fisher is High, and that the overall immediacy of these threats is Non-imminent. Pursuant to our Listing Priority System (64 FR 7114), a DPS of a species for which threats are high and non-imminent is assigned a Listing Priority Number of 6. The threats are high occurring across the entire range of the DPS resulting in a negative impact on fisher distribution and abundance. The threats are non-imminent as the greatest long-term risks to fishers in the DPS are the subsequent ramifications of the threats and environmental stochasticity interacting synergistically on the three extant populations.

__Yes__ Have you promptly reviewed all of the information received regarding the species for the purpose of determination whether emergency listing is needed?

Emergency Listing Review

__No__ Is Emergency Listing Warranted?

There is currently no emergency posing a significant risk to the conservation of the West Coast DPS of fisher.

Description of Monitoring:

Monitoring of the West Coast DPS of the fisher will include reviewing the current scientific literature, and contacting species experts and State agencies regarding fisher status and threats. We will work with private and public landowner staff on identifying fisher status and threats. These efforts will be ongoing throughout the monitoring period and occur as information becomes available or on a 6 month basis. Due to the wide ranging nature of the species and its distribution within managed and monitored forest landscapes, it is our opinion that such a level of monitoring is appropriate to update the status of the species, given the species and the threats it faces.

Indicate which State(s) (within the range of the species) provided information or comments on the species or latest species assessment:

none

Indicate which State(s) did not provide any information or comment:

California,Oregon

State Coordination:

We received regular updates and information on reintroduction efforts occurring in Washington (See *Current Range/Distribution* section for more information).

Literature Cited:

Agee JK. 1991. Fire history of Douglas-fir forests in the Pacific Northwest. Pp. 25–33 in Ruggiero LF, Aubry KB, Carey AB, Huff MH, technical coordinators. Wildlife and Vegetation of Unmanaged Douglas-Fir Forests. USDA Forest Service, Pacific Northwest Region. Portland, Oregon, USA.

Agee JK, Skinner CN. 2005. Basic principles of forest fuels reduction treatments. Forest Ecology and Management. 211(2005) 83–96.

Aldous A, Gonzalez AP, Popper K. 2007. A method for incorporating climate change into conservation action plans. The Nature Conservancy, Oregon.

Alig RJ, Plantinga AJ, Ahn S, Kline JD. 2003. Land use changes involving forestry in the United States: 1952 to 1997, with projections to 2050 [Gen. Tech. Rep. PNW-GTR-587]. Portland (OR): USDA Forest Service, Pacific Northwest Research Station. 92 p.

Anderson E. 1994. Evolution, prehistoric distribution, and systematics of Martes. In: Buskirk SW, Harestad AS, Raphael MG, Powell RA, editors. Martens, sables and fishers: biology and conservation. Ithaca (NY): Cornell University Press. p 13–25.

Arthur, SM, Krohn WB. 1991. Activity patterns, movements, and reproductive ecology of Fishers in southcentral Maine. Journal of Mammalogy 72(2):379–385.

Arthur SM, Paragi TF, Krohn WB. 1993. Dispersal of Juvenile Fisher in Maine. Journal of Wildlife Management 57(4): 868–874.

Aubry 2012. Keith Aubry, Research Wildlife Biologist, USDA Forest Service, Pacific Northwest Research Station, Olympia, WA. Email message to J. Scott Yaeger, Fish and Wildlife Biologist, USDI Fish and Wildlife Service, Yreka, CA (March 28, 2012).

Aubry KB, Crites MJ, West SD. 1991. Regional patterns of small mammal abundance and community composition in Oregon and Washington. Pp. 284–294 in Ruggiero LF, Aubry KB, Carey AB, Huff MH, technical coordinators. Wildlife and Vegetation of Unmanaged Douglas-Fir Forests. USDA Forest Service, Pacific Northwest Region. Portland, Oregon, USA.

Aubry KB, Houston DB. 1992. Distribution and status of the fisher (Martes Pennanti) in Washington. Northwestern Naturalist 73: 69–79.

Aubry KB, Lewis JC. 2003. Extirpation and reintroduction of fishers (Martes pennanti) in Oregon: implications for their conservation in the Pacific states. Biological Conservation 114 (1):79–90.

Aubry KB, Raley CM. 2002. Ecological characteristics of fishers in the southern Oregon Cascade Range: final progress report: 1 June 2002. Olympia (WA): USDA Forest Service, Pacific Northwest Research Station.

Aubry KB, Raley CM. 2006. Ecological characteristics of fishers (Martes pennanti) in the Southern Oregon Cascade Range. USDA Forest Service, Pacific Northwest Research Station, Olympia Forestry Sciences Laboratory. Olympia, Washington, USA.

Aubry KB, Wisely SM, Raley CM, Buskirk SW. 2004. Zoogeography, spacing patterns, and dispersal in fishers: insights gained from combining field and genetic data. Pages 201–220 in Harrison DJ, Fuller AK, editors. Martens and fishers (Martes) in human-altered environments: an international perspective. Springer Science+Business Media, New York, USA.

Ausband DE, Baty GR. 2005. Effects of precommercial thinning on snowshoe hare habitat use during winter on low elevation montane forests. Canadian Journal of Forest Resources. 35:206–210.

Bailey V. 1936. The mammals and life zones of Oregon. North American Fauna 55:1–416.

BC Conservation Data Centre. 2012. BC Species and Ecosystems Explorer. BC Minist. of Environ. Victoria, BC. Available at: [http://a100.gov.bc.ca/pub/eswp/] (accessed April 13, 2012)

BC Ministry of Environment. 2009. 2008–2009 Hunting and Trapping Regulations Synopsis – Complete Available at: [http://www.env.gov.bc.ca/fw/wildlife/hunting/regulations/] (accessed April 13, 2012).

BC Species and Ecosystems Explorer. 2003. Victoria, British Columbia, Canada. Available: http://srmapps.gov.bc.ca/apps/eswp/ (accessed April 13, 2006).

Beardsley D, Bolsinger C, Warbington R. 1999. Old-growth forests in the Sierra Nevada: by type in 1945 and 1993 and ownership in 1993. Portland (OR): USDA Forest Service Pacific Northwest Research Station. GTR-PNW-RP-516.

Beier P. 1995. Dispersal of juvenile cougars in fragmented habitat. Journal of Wildlife Management 59(2):228–37.

Beyer KM, Golightly RT. 1996. Distribution of fisher and other forest carnivores in central northwestern California. Final Report to the California Department of Fish and Game.

Bittner SL, Rongstad OJ. 1982. Snowshoe hare and allies (Lepus americanus and Allies). Pages 146–163 in Chapman JA, Feldhamer GA, editors. Wild mammals of North America: biology, management, and economics. John Hopkins University Press, Baltimore, Maryland, USA.

Bolsinger CL, Waddell KL. 1993. Area of old-growth forests in California, Oregon, and Washington. USDA Forest Service, Pacific Northwest Research Station. Resource Bulletin PNW-RB-197.

Bowman JC, Sleep D, Forbes GJ, Edwards M. 2000. The association of small mammals with coarse debris at log and stand scales. Forest Ecology and Management 129(2000)119–124.

Booth DE. 1991. Estimating pre-logging old-growth in the Pacific Northwest. Journal of Forestry 89(10):25–29.

Boyce MS. 1992. Population viability analysis. Annual Review of Ecology and Systematics 23:481–506.

British Columbia Ministry of Environment. 2009. 2009–2010 hunting and trapping regulations synopsis.

Available at:
[http://www.env.gov.bc.ca/fw/wildlife/hunting/regulations-/0910/docs/Trapping_Regulations.pdf] (Accessed 6 May 2010).

Brander RB, Brooks DJ. 1973. Return of the fisher. Natural History 82:52–57.

Brown RN, Gabriel MW, Matthews S, Higley JM, Wengert G, Foley JE. 2007. Pathogens associated with fishers. Pathogens associated with fishers (Martes pennanti) and sympatric mesocarnivores in California - Final draft report. United States Fish and Wildlife Service, Yreka, California, USA.

Buck SG, Mullis C, Mossman AS. 1979. A radio-telemetry study of fishers in northwestern California. Cal-Neva Wildlife Transactions:166–172.

Buck SG, Mullis C, Mossman AS, Show I, Coolahan C. 1994. Habitat use by fishers in adjoining heavily and lightly harvested forest. In: Buskirk SW, Harestad AS, Raphael MG, Powell RA, editors. Martens, sables and fishers: biology and conservation. Ithaca (NY): Cornell University Press. p 368–76.

Buskirk SW, Powell RA. 1994. Habitat ecology of fishers and American martens. In: Buskirk SW, Harestad AS, Raphael MG, Powell RA, editors. Martens, sables and fishers: biology and conservation. Ithaca (NY): Cornell University Press. p 283–296.

Buskirk SW, Raley CM, Aubry KB, Zielinski WJ, Schwartz MK, Golightly RT, Purcell KL, Weir RD, Yaeger JS. 2010. Meta-analysis of resting site selection by the fisher in the Pacific coastal states and provinces. Report Interagency Agreement 06-IA-11261952-429 and 07-IA-11261992-162.

California Department of Fish and Game (CDFG). 2007. California wildlife: Conservation challenges. California's wildlife action plan. 597 pages.

California Department of Fish and Game (CDFG). 2010. Report to the fish and game commission: A status review of the fisher (Martes pennanti) in California. February 2010

California Department of Forestry and Fire Protection (CAL FIRE). 2010. California Forest Practice Rules 2010; Title 14, California Code of Regulations. Chapters 4, 4.5 and 10. Compiled by the California Department of Forestry and Fire Protection, Sacramento, CA. Available at:
[http://www.fire.ca.gov/resource_mgt/downloads/2010_FP_Rulebook_w-Diagrams_wo-TechRule_No1.pdf] (Accessed 5 May 2010).

Callas RL, Figura P. 2008. Translocation plan for the reintroduction of fishers (Martes pennanti) to lands owned by Sierra Pacific Industries in the northern Sierra Nevada of California. California Department of Fish and Game.

Campbell LA, Zielinski WJ, Macfarlane DC. 2000. A risk assessment for four forest carnivores in the Sierra Nevada under proposed forest service management activities [unpublished report]. USDA Forest Service Sierra Nevada Framework Project.

Carey AB, Johnson ML. 1995. Small mammals in managed, naturally young, and old-growth forests. Ecological Applications. Vol. 5 no. 2 pp.336–352.

Carroll A, Taylor S, Régnière J, Safranyik L. 2003. Effects of climate change on range expansion by the mountain pine beetle in British Columbia. Pages 223–232 in Shore TL, Brooks JE, Stone JE editors. Mountain Pine Beetle Symposium: Challenges and Solutions. October 30–31, 2003, Kelowna, British Columbia. Natural Resources Canada, Canadian Forest Service, Pacific Forestry Centre, Information Report BC-X-399, Victoria, BC.

Carroll CR. 2005. Reanalysis of regional fisher suitability including survey data from commercial forests in the redwood region. A report to the USFWS.

Carroll CR, Zielinski WJ, Noss RF. 1999. Using presence/absence data to build and test spatial habitat models for the fisher in the Klamath region, USA. Conservation Biology 13(6):1344–59.

Clayton 2011. David Clayton, Biologist, Rogue River-Siskiyou National Forest, Medford, OR. Email message to J. Scott Yaeger, Fish and Wildlife Biologist, USDI Fish and Wildlife Service, Yreka, CA (April 5, 2011).

Clifford D, Gabriel M, Wengert G. 2012. Disease & predation in fisher populations: paradigm shifts – future approaches – management options. Presentation given at the West Coast Fisher Symposium 2012. 31 January to 1 February 2012, Sacramento, CA. Available at: [http://www.fws.gov/yreka/fisherEI.html] Accessed 16 April, 2012.

Cole PJ, Proulx G. 1994. Leghold trapping: a cause of serious injuries to fishers. Martes Working Group Newsletter 2:14–5.

Coulter MW. 1966. Ecology and management of fishers in Maine [PhD thesis]. Syracuse (NY): Syracuse University. 183 p.

Dark SJ. 1997. A landscape-scale analysis of mammalian carnivore distribution and habitat use by fisher [MSc thesis]. Arcata (CA): Humboldt State University.

Davis FW, Seo C, Zielinski WJ. 2007. Regional variation in home-range-scale habitat models for fisher (Martes pennanti) in California. Ecological Application (17)8 pp. 2195–2213.

Davis LR. 2009. Denning ecology and habitat use by fisher (Martes pennanti) in pine dominated ecosystems of the Chilcotin Plateau. Simon Fraser University.

Diller 2008. Lowell V. Diller, Biologist, Green Diamond Resource Company, Korbel, CA. Phone conversation with J. Scott Yaeger, Fish and Wildlife Biologist, USDI Fish and Wildlife Service, Yreka, CA (January 2008).

Dodge WE. 1982. Porcupine. Pages 355–366 in Chapman JA, Feldhamer GA, editors. Wild mammals of North America: biology, management, and economics. John Hopkins University Press, Baltimore, Maryland, USA.

Douglas CW, Strickland MA. 1987. Fisher. In: Novak M, Baker JA, Obbard ME, Malloch B, editors. Wild furbearer management and conservation in North America. Ontario Ministry of Natural Resources and the Ontario Trappers Association. p 511–29.

Drew RE, Hallett JG, Aubry KB, Cullings KW, Koepf SM, Zielinski WJ. 2003. Conservation genetics of the fisher (Martes pennanti) based on mitochondrial DNA sequencing. Molecular Ecology 12:51–62.

Earle RD. 1978. The fisher-porcupine relationship in Upper Michigan [MSc thesis]. Houghton (MI): Michigan Technical University.

Ellsworth, E. and T.D. Reynolds. (2006, July 19). Snowshoe Hare (Lepus americanus): a technical conservation assessment. [Online]. USDA Forest Service, Rocky Mountain Region. Available: http://www.fs.fed.us/r2/projects/scp/assessments/snowshoehare.pdf [16 April, 2012].

Erxleben, JCP, 1777. Systema regni animalis per classes, ordines, genera, species, varietates: cvm synonymia et historia animalivm: Classis I. Mammalia. Lipsiae: Impensis Weygandianis.

Facka 2011. Aaron Facka, Biologist, PhD. Candidate, North Carolina State University, Raleigh, NC. Email message to J. Scott Yaeger, Fish and Wildlife Biologist, USDI Fish and Wildlife Service, Yreka, CA (December 23, 2011).

Farber S, Criss S. 2006. Cooperative mesocarnivore surveys for the Upper West Fork and Beaver Creek watersheds in interior northern California. Final Report to the USDI Fish and Wildlife Service, Yreka CA.

Farber S, Callas R, Finley L, Yaeger JS, Schwartz M, Pilgrim K, Powell R, Swiers R. 2010. Cooperative mesocarnivore genetic surveys to estimate the number of individuals and preliminary sub-population trend in northern Siskiyou County, California: Draft 15 April 2010. 16 pg. [Unpublished report]. USDI Fish and Wildlife Service Yreka Fish and Wildlife Office, Yreka, California.

Forest Ecosystem Management Assessment Team [FEMAT] (Thomas TW, et al.). 1993. Forest ecosystem management: an ecological, economic and social assessment. Washington, DC: USDA Forest Service and collaborating agencies. US Government Printing Office 793–071.

Folliard L. 1997. Discovery of an accidental trap for Pacific fishers. The Marten [newsletter of the California North Coast Chapter of The Wildlife Society] 2(2):7.

Forest Carnivore Surveys in the Pacific States. 2012. Available at: [http://maps.fs.fed.us/carnivore/Modules/application/home.html.] (Accessed April 18, 2011). Comment: Website was experiencing technical difficulties at the time of the 2012 review. Aubry (2012, pers. Comm.) confirmed no new reports from areas previously undetected.

Franklin JF, Fites-Kaufmann JA. 1996. Assessment of late-successional forests of the Sierra Nevada. In: Sierra Nevada ecosystem project, final report to Congress, Vol. 2: Assessments and scientific basis for management options. Davis (CA): Centers for Water and Wildland Resources, Univ. of Calif. p 627–62.

Franklin JF, Spies TA. 1986. Ecology of old-growth Douglas-fir forests. [Special issue on old-growth forests] Oregon Birds 12(2):79–90.

Franklin JF, Spies TA. 1991a. Composition function and structure of old-growth Douglas-fir forests. Pages 71–77 in Ruggiero LF, Aubry KB, Carey AB, Huff MH, technical coordinators. Wildlife and Vegetation of Unmanaged Douglas–Fir Forests. USDA Forest Service, Pacific Northwest Region. Portland, Oregon, USA.

Franklin JF, Spies TA. 1991b. The structure of natural young, mature and old-growth Douglas-fir forests in Oregon and Washington. Pages 91–109 in Ruggiero LF, Aubry KB, Carey AB, Huff MH, technical coordinators. Wildlife and Vegetation of Unmanaged Douglas-Fir Forests. USDA Forest Service, Pacific Northwest Region. Portland, Oregon, USA.

Franklin JF, Spies TA, Van Pelt R, Carey AB, Thornburgh DA, Berg DR, Lindenmayer DB, Harmon ME, Keeton WS, Shaw DC, Bible K, Chen J. 2002. Disturbances and structural development of natural forest ecosystems with silvicultural implications, using Douglas-fir forests as an example. Forest Ecology and Management 155:399–423.

Gabriel 2010. Mourad Gabriel. Ph.D. candidate, UC Davis. Email message to Laura Finley, Fish and Wildlife Biologist, USDI Fish and Wildlife Service, Yreka, CA (April 26, 2010).

Gabriel 2012. Mourad Gabriel. Ph.D. candidate, UC Davis. Email message to Scott Yaeger, Fish and Wildlife Biologist, USDI Fish and Wildlife Service, Yreka, CA (March 19, 2012).

Gabriel et al. 2011. Mourad W. Gabriel (Ph.D. candidate, UC Davis.) Woods L, Clifford D, McMillin S, and Poppenga R. 2011. Frequently asked questions about rodenticide baits: Q&A: fishers & rodenticide exposure. Unpublished document on file with Yreka Fish and Wildlife Service.

Gibilisco CJ. 1994. Distributional dynamics of modern Martes in North America. In: Buskirk SW, Harestad AS, Raphael MG, Powell RA, editors. Martens, sables and fishers: biology and conservation. Ithaca (NY): Cornell University Press. p 59–71.

Goldman FA. 1935. New American mustelids of the genera Martes, Gulo, and Lutra. Paper presented at the Proceedings Biological Society of Washington 48.

Golightly RT, Penland TF, Zielinski WJ, Higley JM. 2006. Fisher diet in the Klamath/North Coast Bioregion, Unpublished Report. Department of Wildlife, Humboldt State University. Arcata, California, USA.

Green GA, Campbell LA, Macfarlane DC. 2008. A conservation assessment for fishers (Martes pennanti) in the Sierra Nevada of California. USDA Forest Service, Pacific Southwest Region, Vallejo, California.

Green RE. 2007. Distribution and habitat associations of forest carnivores and an evaluation of the California Wildlife Habitat relationship model for American marten in Sequoia and Kings Canyon National Parks. Humboldt State University, Arcata.

Grinnell J, Dixon JS, Linsdale JM. 1937. Furbearing mammals of California. Vol. 1. Berkeley (CA): Univ. of California Press. 375 p.

Hagmeier EM. 1956. Distribution of marten and fisher in North America. Canadian Field Naturalist 70:149–168.

Hagmeier EM. 1959. A re-evaluation of the subspecies of fisher. Canadian Field-Naturalist 73:185–97.

Hamm KA, Diller LV, Klug RR, McDonald TR. 2003. Spatial independence of fisher (Martes pennanti) at track plates in northwestern California. Am. Midl. Nat. 149:201–210.

Heinemeyer KS, Jones JL. 1994. Fisher biology and management in the western United States. USDA Forest Service Northern Region and Interagency Forest Carnivore Working Group. 120 p.

Higley JM, Matthews S. 2006. Demographic rates and denning ecology of female Pacific fishers (Martes pennanti) in northwestern California: Preliminary report October 2004 – July 2006. Hoopa Valley Tribe and Wildlife Conservation Society. Hoopa, California, USA.

Higley JM, Matthews S. 2009. Fisher habitat use and population monitoring on the Hoopa Valley Reservation, California. Hoopa Valley Tribe. Hoopa, CA. Report Final Report USFWS TWG U-12-NA-1.

IUCN. 1995. IUCN/SSC Guidelines for re-introductions. Forty-first meeting of the IUCN Council, Gland, Switzerland. May 1995, 6 pp. Available at: [http://www.iucn.org/themes/ssc/pubs/policy/reinte.htm.]

Jones JL, Garton EO. 1994. Selection of successional stages by fishers in north-central Idaho. In: Buskirk SW, Harestad AS, Raphael MG, Powell RA, editors. Martens, sables and fishers: biology and conservation. Ithaca (NY): Cornell University Press.

Jordan MJ. 2007. Fisher Ecology in the Sierra National Forest, California. Dissertation, University of California, Berkeley.

Kelly GM. 1977. Fisher (Martes pennanti) biology in the White Mountain National Forest and adjacent areas.

Amherst (MA): University of Massachusetts.

Klug RR. 1997. Occurrence of Pacific fisher (Martes pennanti) in the Redwood Zone of northern California and the habitat attributes associated with their detections [MSc thesis]. Arcata (CA): Humboldt State University.

Knaus BJ, Cronn R, Liston A, Pilgrim P, Schwartz MK. 2011. Mitochondrial genome sequences illuminate maternal lineages of conservation concern in a rare carnivore. In Press BMC Ecolgoy.

Koepfli KP, Deere KA, Slater GJ, Begg C, Begg K, Grassman L, Lucherini M, Veron G, and Wayne RK. 2008. Multigene phylogeny of the Mustelidae: Resolving relationships, tempo and biogeographic history of a mammalian adaptive radiation. BMC Biology 6:1-22.

Krohn WB, Arthur SM, Paragi TF. 1994. Mortality and vulnerability of a heavily trapped fisher population. In: Buskirk SW, Harestad AS, Raphael MG, Powell RA, editors. Martens, sables and fishers: biology and conservation. Ithaca (NY): Cornell University Press. p 137–146.

Kyle CJ, Robitaille F, Strobeck C. 2001. Genetic variation and structure of fisher (Martes pennanti) populations across North America. Molecular Ecology 10: 2341–7.

Lamberson RH, Truex RL, Zielinski WJ, MacFarlane D. 2000. Preliminary analysis of fisher population viability in the southern Sierra Nevada. Arcata (CA): Humboldt State University.

Lehmkuhl JF, Ruggiero LF. 1991. Forest fragmentation in the Pacific Northwest and its potential effects on wildlife. Pages 35–46 in Ruggiero LF, Aubry KB, Carey AB, Huff MH, technical coordinators. Wildlife and Vegetation of Unmanaged Douglas-Fir Forests. USDA Forest Service, Pacific Northwest Region. Portland, Oregon, USA.

Lewis 2009. Jeffrey C. Lewis, Biologist, Washington Department of Fish and Wildlife, Olympia, WA. Email message to J. Scott Yaeger, Fish and Wildlife Biologist, USDI Fish and Wildlife Service, Yreka, CA (April 2, 2009).

Lewis JC, Happe PJ. 2008. Olympic Fisher Reintroduction Project: 2008 Progress Report. Washington Department of Fish and Wildlife and USDI National Park Service.

Lewis JC, Happe PJ, Jenkins KJ, and Manson DJ. 2011. Olympic Fisher Reintroduction Project: 2010 Progress Report. Washington Department of Fish and Wildlife and USDI National Park Service. April 2011

Lewis JC, Hayes GE. 2004. Feasibility assessment for reintroducing fishers (Martes pennanti) to Washington. Washington Department of Fish and Wildlife, Olympia. 70 pp.

Lewis JC, Stinson DW. 1998. Washington State status report for the fisher. Olympia (WA): Washington Department of Fish and Wildlife.

Lewis JC, Zielinski WJ. 1996. Historical harvest and incidental capture of fishers in California. Northwest Science 70(4):291–7.

Lewis JC, Powell RA, and Zielinski WJ. 2012. Carnivore Translocations and Conservation: Insights from Population Models and Field Data for Fishers (Martes pennanti). PLoS ONE 7:e32726. doi:32710.31371/journal.pone.0032726.

Lindstrand L III. 2006. Detections of Pacific fisher around Shasta Lake in northern California. Transactions of the western section of the wildlife society 42:47–52.

Lofroth EC, Raley CR, Higley JM , Truex RL, Yaeger JS, Lewis JC, Happe PJ , Finley LL, Naney RH, Hale LJ, Krause AL, Livingston SA, Myers AM, Brown RN. 2010. Conservation of Fishers (Martes pennanti) in South-Central British Columbia, Western Washington, Western Oregon, and California –Volume I: Conservation Assessment. USDI Bureau of Land Management, Denver, Colorado, USA.

Lofroth, EC, Higley JM, Naney RH, Raley CM, Yaeger JS, Livingston SA, and Truex RL. 2011. Conservation of Fishers (Martes pennanti) in South-Central British Columbia, Western Washington, Western Oregon, and California-Volume II: Key Finding from Fisher Habitat Studies in British Columbia, Montana, Idaho, Oregon, and California.

Luque MH. 1983. Report on fisher survey - 1983. Boise: Idaho Dept. Fish and Game Rep. 17 p.

Lyon LJ, Aubry KB, Zielinski WJ, Buskirk SW, Ruggiero LF. 1994. The scientific basis for conserving forest carnivores: considerations for management. In: Ruggiero LF, Aubry KB, Buskirk SW, Zielinski WJ, tech. editors. The scientific basis for conserving forest carnivores: American marten, fisher, lynx, and wolverine. Fort Collins (CO): USDA Forest Service, Rocky Mtn. Forest and Range Exp. Station. GTR-RM-254. p 128–37.

Mader HJ. 1984. Animal habitat isolation by roads and agricultural fields. Biological Conservation. 29:81–96.

Mansergh IM, Scotts DJ. 1989. Habitat continuity and social organization of the mountain pygmy-possum restored by tunnel. Journal of Wildlife Management 53(3):701.

Matthews SM, Higley JM, Carlson PC. 2008. Northern spotted owl demographic analysis and fisher habitat use, population monitoring, and the dispersal feasibility on the Hoopa Valley Indian Reservation, California. Final Report submitted to the USDI Fish and Wildlife Service, February 2008.

Matthews SM, Higley JM, Green RE, Rennie KM, Goddard CA. 2009. Juvenile fisher dispersal patterns on Hoopa Valley Reservation, California: Preliminary report to U.S. Fish and Wildlife Service Yreka Field Office: In partial fulfillment of agreement number 813338G015. Hoopa Valley Tribe, Hoopa, California, USA.

Matthews SM, Higley JM, Yaeger JS, Fuller TK. 2011. Density of fishers and the efficacy of relative abundance indices and small–sacle occupancy estimation to detect a population decline on the Hoopa Valley Indian Reservation, California. Wildlife Society Bulletin 35(2):69–75.

Mazzoni AK. 2002. Habitat use by fishers (Martes pennanti) in the southern Sierra Nevada [MSc thesis]. Fresno (CA): California State University.

McComb WC. 2003. Ecology of coarse woody debris and its role as habitat for mammals. Pages 374–404 in Zabel CJ, Anthony RG, editors. Mammal community dynamics: management and conservation in the coniferous forests of North America. Cambridge University Press, Cambridge, United Kingdom.

McKelvey KS, Johnston JD. 1992. Historical perspectives on forests of the Sierra Nevada and Transverse Ranges of southern California: forest conditions at the turn of the century. In: Verner J , McKelvey KS, Noon BR, Guttierez RJ, Gould GI, Beck TW, editors. The California spotted owl: a technical assessment of its current status. Albany (CA): USDA Forest Service. Gen. Tech. Rep. PSW-GTR- 133. p 225–46.

McKelvey KS, Skinner CN, Chang C, Erman DC, Husari SJ, Parsons DJ, van Waglendonk JW, Weatherspoon CP. An overview of fire in the Sierra Nevada. 1996. In Sierra Nevada Ecosystem Project Final Report to Congress Vol. II, Assessment and Basis for Management Options. Davis: University of California, Centers for Water and Wildland Resources.

McKenzie DZ, Gedalof, Peterson DL, Mote P. 2004. Climatic change, wildfire, and conservation. Conservation Biology 18:890–902.

Naney RN, Finley LL, Lofroth EC, Happe PJ, Krause AL, Raley CR, Truex RL, Hale LJ, Higley JM, Kosic AD, Lewis JC, Livingston SA, MacFarlane DC, Myers AM, Yaeger JS. 2012. Conservation of Fishers (Martes pennanti) in South-Central British Columbia, Western Washington, Western Oregon, and California –Volume III: Threats Assessment. USDI Bureau of Land Management, Denver, Colorado, USA. In Press.

Northwest Oregon State Forests Management Plan: Final Plan January 2001. Available at:[http://www.odf.state.or.us/DIVISIONS/management/state_forests/sfplan/nwfmp01-final/nwfmp.asp.] (Accessed May 5, 2010).

Oregon Department of Forestry [ODF]. 2000. Oregon's Forest Protection Laws: An Illustrated Manual. Portland (OR): Oregon Forest Resources Institute. 160 p.

Osborn 2003. Scott Osborn, Biologist, California Dept. of Fish and Game, Timberland Conservation Planning, Eureka, CA. Telephone conversation with Gary Falxa, USDI Fish and Wildlife Service, Arcata, CA (October 20, 2003).

Paragi, TF, Arthur SM, Krohn WB. 1996. Importance of tree cavities as natal dens for fishers. Northern Journal of Applied Forestry 13:79–83.

Powell RA. 1981. Martes pennanti. Mammalian Species 156:1–6.

Powell RA. 1993. The fisher: life history, ecology and behavior. 2nd ed. Minneapolis: University of Minnesota Press.

Powell RA, Zielinski WJ. 1994. Fisher. In: Ruggiero LF, Aubry KB, Buskirk SW, Zielinski WJ, tech. editors. The scientific basis for conserving forest carnivores: American marten, fisher, lynx, and wolverine. Fort Collins (CO): USDA Forest Service, Rocky Mtn. Forest and Range Exp. Station. GTR-RM-254. p 38–73.

Proulx G, Aubry K, Birks J, Buskirk S, Fortin C, Frost H, Krohn W, Mayo L, Monakhov V, Payer D, Saiki M, Santos-Reis M, Weir R, Zielinski W. 2004. World distribution and Status of the Genus Martes in 2000. Pages 21–76 in D. J. Harrison, A. K. Fuller, and G. Proulx, editors. Martens and fishers (Martes) in human altered environments: an international perspective. Springer, New York, New York, USA.

Proulx G, Kolenosky AJ, Badry MJ, Drescher RK, Seidel K, Cole PJ. 1994. Post-release movements of translocated fishers. In: Buskirk SW, Harestad AS, Raphael MG, Powell RA, editors. Martens, sables and fishers: biology and conservation. Ithaca (NY): Cornell University Press.

Purcell K., Mazzoni A, Mori S, Boroski B. 2009. Resting structures and resting habitat of fishers in the southern Sierra Nevada, California. Forest Ecology and Management 258: 2696–2706.

Rand AL. 1944. The status of the fisher (Martes pennanti Erxleben) in Canada. Canadian Field-Naturalist 58:77–81.

Reno MA, Rulon KR, James CE. 2008. Fisher monitoring within two industrially managed forests of Northern California. Progress Report to California Department of Fish and Game. Sierra Pacific Industries, Anderson, CA.

Riley SPD, Foley J, Chomel B. 2004. Exposure to feline and canine pathogens in bobcats and gray foxes in urban and rural zones of a national park in California. Journal of Wildlife Diseases 40:11–22.

Rosenberg KV, Raphael MG. 1986. Effects of forest fragmentation on vertebrates in Douglas-fir forests. In: Verner J, Morrison ML, Ralph C, editors. Wildlife 2000: Modeling habitat relationships of terrestrial vertebrates. Madison (WI): Univ. of Wisconsin Press. p 263–72.

Roy KD. 1991. Ecology of reintroduced fishers in the Cabinet Mountains of northwest Montana [MSc. Thesis]. Missoula (MT): University of Montana. 94 p.

Ruediger W, Claar J, Gore J. 1999. Restoration of carnivore habitat connectivity in the northern Rockies. In: Evink GL, Garrett P, Zeigler D, editors. Proceedings of the 3rd International Conference on Wildlife Ecology and Transportation. Tallahassee (FL): Florida Department of Transportation. FL-ER-73-99. 330 p.

Safford HD. 2007. Potential impacts of climate change to fisher habitat in California: a preliminary assessment. USDA Forest Service, Pacific Southwest Region. Unpublished report.

Sakai HF, Noon BR. 1993. Dusky footed woodrat abundance in different-aged forests in northwestern California. The Journal of Wildlife Management. Vol. 57, no. 2. Pp. 373–382.

Schwartz MK. 2007. Ancient DNA confirms native Rocky Mountain fisher (Martes pennanti) avoided early 20th century extinction. Journal of Mammalogy. 88(4):921–925.

Seglund AE. 1995. The use of rest sites by the Pacific fisher [MSc thesis]. Arcata (CA): Humboldt State University. 66 p.

Self S, Callas R. 2006. Pacific Fisher Natal and Maternal Den Study: Progress Report No. 1. Sierra Pacific Industries and California Department of Fish and Game.

Self SE, Kerns SJ. 2001. Pacific fisher use of a managed forest landscape in northern California [Unpublished report]. Redding (CA): Sierra Pacific Industries. Available at [http://www.spi-ind.com/Our_Forests/PDF/WRPNo6.pdf.]

Self S, Murphy E, Farber S. 2008. Preliminary estimate of fisher populations in California and southern Oregon. Unpublished Report: Sierra Pacific Industries, PO Box 496014, Redding, California 96049.

Shaffer ML. 1981. Minimum population sizes for conservation. Bioscience 31:131–4.

Shaffer ML. 1987. Minimum viable populations: coping with uncertainty. In: Soulé ME, editor. Viable populations for conservation. Cambridge: Cambridge Univ. Press. p 69–86.

Simpson Resource Company. 2003. Summary of Pacific fisher studies on Simpson Resource Company Timberlands, north coastal California: Comments on the status review of the Pacific fisher (Martes pennanti pacifica). On file with USDI Fish and Wildlife Service, Yreka, California, Sacramento, California.

Skinner CN, Taylor AH. 2006. Southern Cascades Bioregion. In: NG Sugihara, Van Wagtendonk JW, Shaffer KE, Fites-Kaufman J, Thode AE, editors. Fire in California's Ecosystems. University of California Press. Pages 195–224.

Skinner, CN, Taylor AH, Agee JK. 2006. Klamath Mountain Bioregion. In: NG Sugihara, Van Wagtendonk JW, Shaffer KE, Fites-Kaufman J, Thode AE, editors. Fire in California's Ecosystems. University of California Press. Pages 170–194.

Slauson KM, Zielinski WJ. 2001. Distribution and habitat ecology of American martens and Pacific fishers in southwestern Oregon. Progress Report to the Oregon Department of Fish and Wildlife.

Slauson KM, Zielinski WJ, Holm GW. 2003. Distribution and habitat associations of Humboldt marten (Martes americana huboldtensis) and Pacific fisher (Martes pennanti pacifica) in Redwood National and State Parks. Final Report to the National Park Service, Orick, CA.

Slauson KM, Zielinski WJ. 2007. Strategic Surveys for Martes Populations In Northwestern California: Mendocino National Forest USDA. Forest Service, Pacific Southwest Research Station, Redwood Sciences Laboratory, Arcata, California.

Smith WB, Vissage JS, Darr DR, Sheffield RM. 2001. Forest resources of the United States, 1997 [Gen. Tech. Rep. NC-219]. St. Paul (MN): USDA Forest Service, North Central Research Station. 190p.

Spencer W, Rustigian-Romsos H, Scheller R, Syphard A, Strittholt J, Ward B. 2008. Baseline evaluation of fisher habitat and population status, and effects of fires and fuels management on fishers in the southern Sierra Nevada. Unpublished report prepared for USDA Forest Service, Pacific Southwest Region. June 2008. 133 pp + appendices.

Spencer W, Rustigian-Romsos H, Strittholt J, Scheller R, Zielinski W, Truex R. 2011. Using occupancy and population models to assess habitat conservation opportunities for an isolated carnivore population. Biological Conservation 144:788-803.

SPI and USFWS. 2008. Candidate conservation agreement with assurance for the fisher for the Stirling Management Area: between Sierra Pacific Industries and U.S. Fish and Wildlife Service. Permit # TE166855-0. Dated 15 May 2008.

Stacey PB, Taper M. 1992. Environmental variation and the persistence of small populations. Ecological Applications 2(1):18–29.

Stephens 2006. Jeff Stephens, Biologist, USDI Bureau of Land Management, Medford District, Ashland Wildlife Team, 3040 Biddle Road, Medford, OR, 97504. Email to Scott Yaeger, USDI Fish and Wildlife Service, Yreka, CA (May 1, 2006).

Strickland MA, Douglas CW. 1984. Results of questionnaires sent to trappers of fisher and marten in the Algonquin Region in five consecutive years 1979 to 1983. Toronto: Ontario Ministry of Natural Resources Report 49.

Southwest Oregon State Forests Plan. 2001. Available at: [http://www.odf.state.or.us/DIVISIONS/management/state_forests/sfplan/swfmp01-final/swfmp.asp]

Sweitzer RA, Barrett RH. 2010. Distribution, site occupancy, and habitat selection by Pacific Fishers in the Sierra National Forest, California. Presentation given at The Western Section Wildlife Society Visalia, CA. Jan 2010. PDF of presentation Available at: [http://snamp.cnr.berkeley.edu/static/documents/2010/03/01/Sweitzer_WesternTWSVisalia_Jan_2010Final.pdf] (Accessed April 23, 2010).

Sweitzer et al. 2011. Rick Sweitzer, Thompson C, Purcell K, Gabriel M, Wengert G, Barrett R. 2011. Survival & causes of mortality for "Pacific" fishers in the southern Sierra Nevada, California. Presentation given at The Western Section Wildlife Society Riverside, CA. Feb 2011. PDF of presentation Available at: [http://snamp.cnr.berkeley.edu/documents/349/] (Accessed April 18, 2011).

Taylor SW, Carroll AL. 2004. Disturbance, forest age, and mountain pine beetle outbreak dynamics in BC: A historical perspective. Pages 41–56 in Shore, T. L., J. E. Brooks, and J. E. Stone, editors. Mountain Pine Beetle Symposium: Challenges and Solutions. October 30–31, 2003, Kelowna, British Columbia. Natural Resources Canada, Canadian Forest Service, Pacific Forestry Centre, Information Report BC-X-399, Victoria, BC.

Thomas NJ, Cole RA. 1996. The risk of disease and threats to the wild population. Endangered Species Update. University of Michigan School of Natural Resources and Environment. December 1996 Vol. 13 No. 12. Available at: [http://www.otterproject.org/esu_1296-/06.html].

Thompson CM, Zielinski WJ, Purcell KL. 2011. Evaluating management risks using landscape trajectory analysis: A case study of California fisher. The Journal of Wildlife Management 75:1164-1176.

Thompson JL. 2008. Density of fisher on managed timberlands in north coastal California. Thesis, Humboldt State University, Arcata, CA.

Thorne ET, Williams ES. 1988. Disease and endangered species: The black-footed ferret as a recent example. Conservation Biology 2(1):66–74.

Tribal Forestry. 1994. Hoopa Valley Indian Reservation forest management plan for the period 1994-2003. Adopted by Tribal Resolution 94–19, 4/20/94. Hoopa, CA. April 21, 1994.

Truex 2009. Truex RL, Zielinski WJ, Bolis JS, Tucker JM. Fisher population monitoring in the southern Sierra Nevada, 2002–2008. Oral presentation: 5th International Martes Symposium: Biology and Conservation of Martens, Sables, and Fishers: A new Synthesis. University of Washington, Seattle, USA. 8–12 September 2009.

Truex RL, Zielinski WJ, Golightly RT, Barrett RL, Wisely SM. 1998. A meta-analysis of regional variation in fisher morphology, demography, and habitat ecology in California [draft report submitted to California Department of Fish and Game]. Arcata (CA): USDA Forest Service, Pacific Southwest Research Station, Redwood Sciences Lab.

U.S. Department of Agriculture (USDA). 1936. Gabrielson asks breathing spell for four dwindling fur animals. March 27, 1936 [No. 1617–36]. Washington, DC. Office of Information, Press Service.

USDA Forest Service. 2000. Sierra Nevada Forest Plan Amendment Final Environmental Impact Statement. USDA Forest Service, Pacific Southwest Region. Volume 3, Chapter 3, Part 4.4.1., p. 2–18.

USDA Forest Service. 2001. Sierra Nevada Forest Plan Amendment Record of Decision. Pacific Southwest Region. January 2001.

USDA Forest Service. 2004. SNFPA Final Supplemental Environmental Impact Statement. Vallejo (CA): USDA Forest Service, Pacific Southwest Region. January 2004.

USDA Forest Service and USDI Bureau of Land Management. 1994a. Final supplemental environmental impact statement on management of habitat for late-successional and old-growth forest related species within the range of the northern spotted. Portland, OR.

USDA Forest Service and USDI Bureau of Land Management. 1994b. Record of Decision for Amendment to Forest Service and Bureau of Land Management Planning Documents within the range of the northern spotted owl. February 1994.

Van Wagtendonk JW, Fites-Kaufman JA. 2006. Sierra Nevada Bioregion. In: Sugihara NG, Van Wagtendonk JW, Shaffer KE, Fites-Kaufman J, Thode AE, editors. Fire in California's Ecosystems. University of California Press. Pages 264–291.

Vinkey RS, Schwartz MK, McKelvey KS, Foresman KR, Pilgrim KL, Giddings BJ, Lofroth EC. 2006. When reintroductions are augmentations: The genetic legacy of fisher (Martes pennanti) in Montana. Journal of Mammalogy 87(2):265–271.

Virginia Department of Game and Inland Fisheries 2012. (http://www.dgif.virginia.gov/wildlife/information/index-.asp?s=050113, accessed 05 April 2012).

Vucetich JA, Waite TA. 1999. Erosion of heterozygosity in fluctuating populations. Conservation Biology 13(4):860–8. Abstract.

Washington Department of Fish and Wildlife (WDFW) 2010. Olympic Fisher Reintroduction Updates: Website: [http://wdfw.wa.gov/wlm/diversty /soc/fisher/updates.htm] (Accessed April, 28 2010).

Washington Department of Natural Resources [WDNR]. 1997. State trust lands habitat conservation plan. Final habitat conservation plan: Washington State Department of Natural Resources. Available at: [http://www.dnr.wa.gov/ResearchScience/Topics/TrustLandsHCP/-Pages/trust_lands_hcp_report.aspx]

Weir RD. 1995. Diet, spatial organization, and habitat relationships of fishers in south- central British Columbia [MSc thesis]. Burnaby (BC): Simon Fraser University.

Weir RD. 2003. Status of the fisher in British Columbia [Wildlife Bulletin No. B-105]. Victoria, BC: British Columbia Ministry of Sustainable Resource Management, Conservation Data Centre, and Ministry of Water, Land and Air Protection, Biodiversity Branch. 38p.

Weir RD, Corbould FB. 2006. Density of fishers in the sub-boreal spruce biogeoclimatic zone of British Columbia. Northwestern Naturalist 87:118–127.

Weir RD, Corbould FB. 2008. Ecology of fishers in sub-boreal forests of north-central British Columbia. Peace Williston Fish and Wildlife Compensation Program Final Report, Prince George, British Columbia, Canada.

Weir RD, Corbould FB. 2010. Factors affecting landscape occupancy by fishers in North-Central British Columbia. Journal of Wildlife Management. 74(3):405–410.

Weir RD, Corbould FB, Harestad AS. 2004. Effect of ambient temperature on the selection of rest structures by fishers. Pages 187–197 in Harrison DJ, A. K. Fuller AK, Proulx G editors. Martens and Fishers (Martes) in human-altered environments: An international perspective. Springer Press, New York, New York, USA.

Weir RD, Harestad AS. 1997. Landscape-level selectivity by fishers in south-central British Columbia. Pages 252–264 in G. Proulx, H. N. Bryant, and P. M. Woodard, editors. Martes: Taxonomy, Ecology, Techniques, and Management. The Provincial Museum of Alberta, Edmonton, Alberta, Canada.

Weir RD, Harestad AS. 2003. Scale-dependent habitat selectivity by fishers in south-central British Columbia. Journal of Wildlife Management 67(1):73–82.

Wengert 2010. Greta M Wengert. (Ph.D. candidate, UC Davis). Fisher relationships with predators in California: Project updates. Presentation given at The Western Section Wildlife Society Visalia, CA. January 2010. PDF on file with Yreka Fish and Wildlife Service.

Wengert et al. 2011. Greta M Wengert, (Ph.D. candidate, UC Davis), Gabriel M, Sweitzer R, Barrett R, Thompson C, Purcell K, Matthews S, Higley JM, Green R, Woods L, Keller S, Gaffney P, Jones M, Sacks B and Munson L. 2011. Identifying Predators of California Fishers: Linking Pathologic Findings to Predator Species Confirmed through Molecular Techniques. Presentation given at The Western Section Wildlife Society Riverside, CA. Feb 2010.

Wisdom, M. J. and L. J. Bate. 2008. Snag density varies with intensity of timber harvest and human access. Forest Ecology and Management 255: 2085–2093.

Wisely SA, Buskirk SW, Russell GA, Aubry KB, Zielinski WJ. 2004. Genetic diversity and structure of the fisher (Martes pennanti) in a peninsular and peripheral metapopulation. Journal of Mammalogy, 85(4):640–648.

Yaeger JS. 2005. Habitat at fisher resting sites in the Klamath Province of Northern California. [MSc thesis]. Arcata (CA): Humboldt State University. 64 p.

York E. 1996. Fisher population dynamics in north-central Massachusetts [MSc thesis]. Amherst (MA): Univ. Massachusetts. 122 p.

Zielinski WJ. 1984. Plague in pine martens and the fleas associated with its occurrence. Great Basin Naturalist 44(1):170–5.

Zielinski WJ, Carroll CR, Campbell LA. 1997a. Using survey data to monitor population status and develop habitat models for fishers and other mesocarnivores: Progress report 1. Arcata (CA): USDA Forest Service, Pacific Southwest Research Station, Redwood Sciences Laboratory.

Zielinski WJ, Carroll C, Dunk JR. 2006. Using landscape suitability models to reconcile conservation planning for two key forest predators. Biological Conservation 133:409–430.

Zielinski WJ, Duncan NP, Farmer EC, Truex RL, Clevenger AP, Barrett RH. 1999. Diet of fishers (Martes pennanti) at the southernmost extent of their range. Journal of Mammalogy 80(3):961–971.

Zielinski WJ, Dunk JR, Yaeger JS, LaPlante DW. 2010 Developing and testing a landscape habitat suitability model for fisher (Martes pennanti) in forests of interior Northern California. Submitted to Forest Ecology and Management 15 April 2010.

Zielinski WJ, Kucera TE, Barret RH. 1995. Current distribution of the fisher, Martes pennanti, in California. California Fish and Game 81(3):104–12.

Zielinski WJ, Stauffer HB. 1996. Monitoring Martes populations in California: survey design and power analysis. Ecological Applications 6:1254–67.

Zielinski WJ, Truex RL, Campbell LA, Carroll CR, Schlexer FV. 2000. Systematic surveys as a basis for the conservation of carnivores in California forests, progress report 2: 1996–1999. Arcata (CA): USDA Forest Service, Pacific Southwest Research Station, Redwood Sciences Laboratory.

Zielinski WJ, Truex RL, Ogan CV, Busse K. 1997b. Detection surveys for fishers and American martens in California, 1989–1994: summary and interpretations. In: Proulx G, Bryant HN, Woodard PM, editors. Martes: taxonomy, ecology, techniques, and management. Edmonton (Alberta); Canada: Provincial Museum of Alberta. p 372–92.

Zielinski WJ, Truex RL, Schlexer FV, Campbell LA, and Carroll C. 2005. Historical and contemporary distributions of carnivores in forests of the Sierra Nevada, California, USA. Journal of Biogeography 2005(32):1385–1407.

Zielinski WJ, Truex RL, Schmidt G, Schlexer R, Schmidt KN, and Barrett RH. 2004a. Resting habitat selection by fishers in California. Journal of Wildlife Management 68:475–492.

Zielinski WJ, Truex RL, Schmidt G, Schlexer R, Schmidt KN, and Barrett RH. 2004b. Home range characteristics of fishers in California. Journal of Mammalogy 85:649–657.

Approval/Concurrence:

Lead Regions must obtain written concurrence from all other Regions within the range of the species before recommending changes, including elevations or removals from candidate status and listing priority changes; the Regional Director must approve all such recommendations. The Director must concur on all resubmitted 12-month petition findings, additions or removal of species from candidate status, and listing priority changes.

Approve: 05/30/2012
Date

Concur: 11/06/2012
Date

Did not concur: ______________________ ______________
Date

Director's Remarks: